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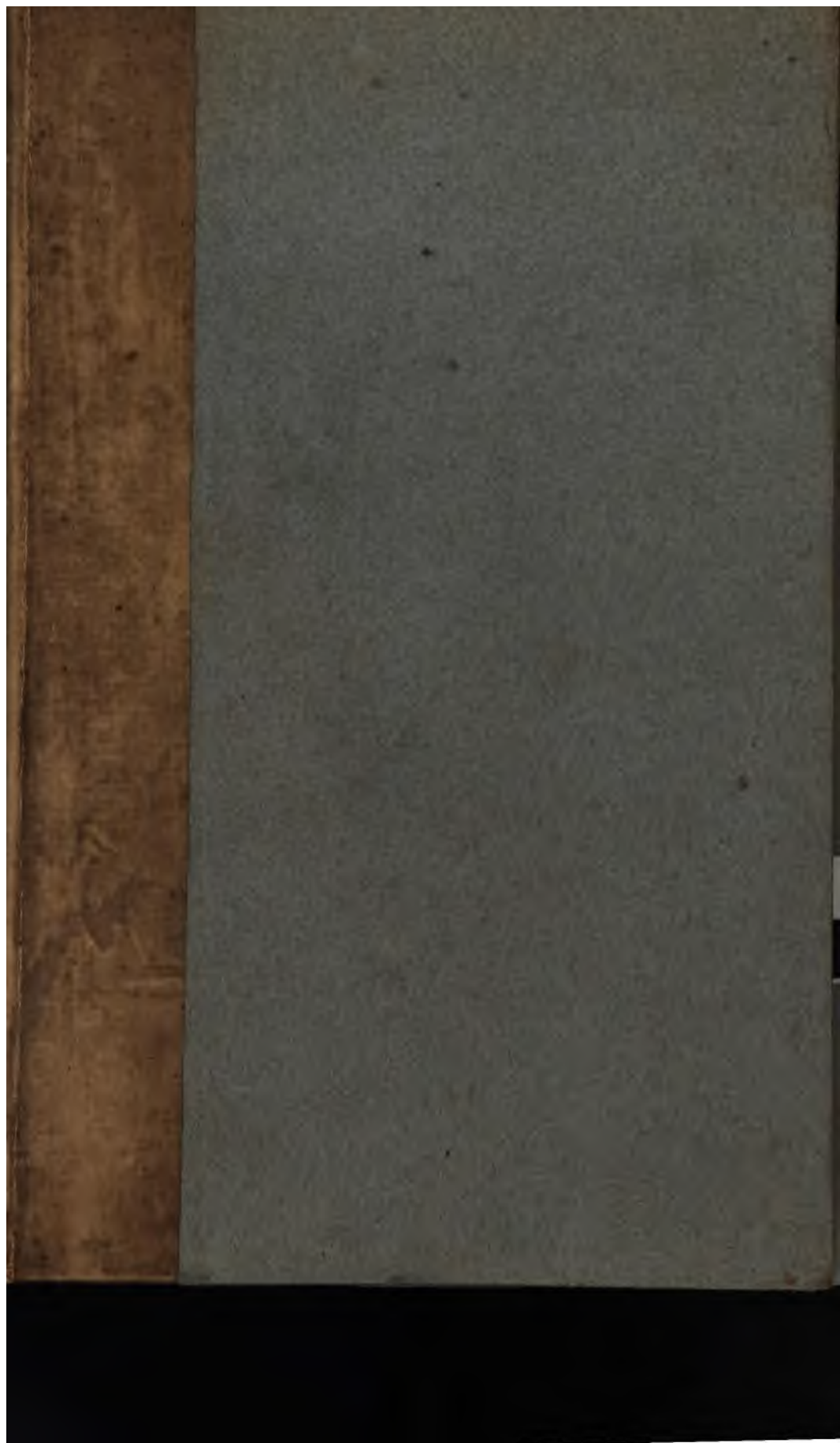
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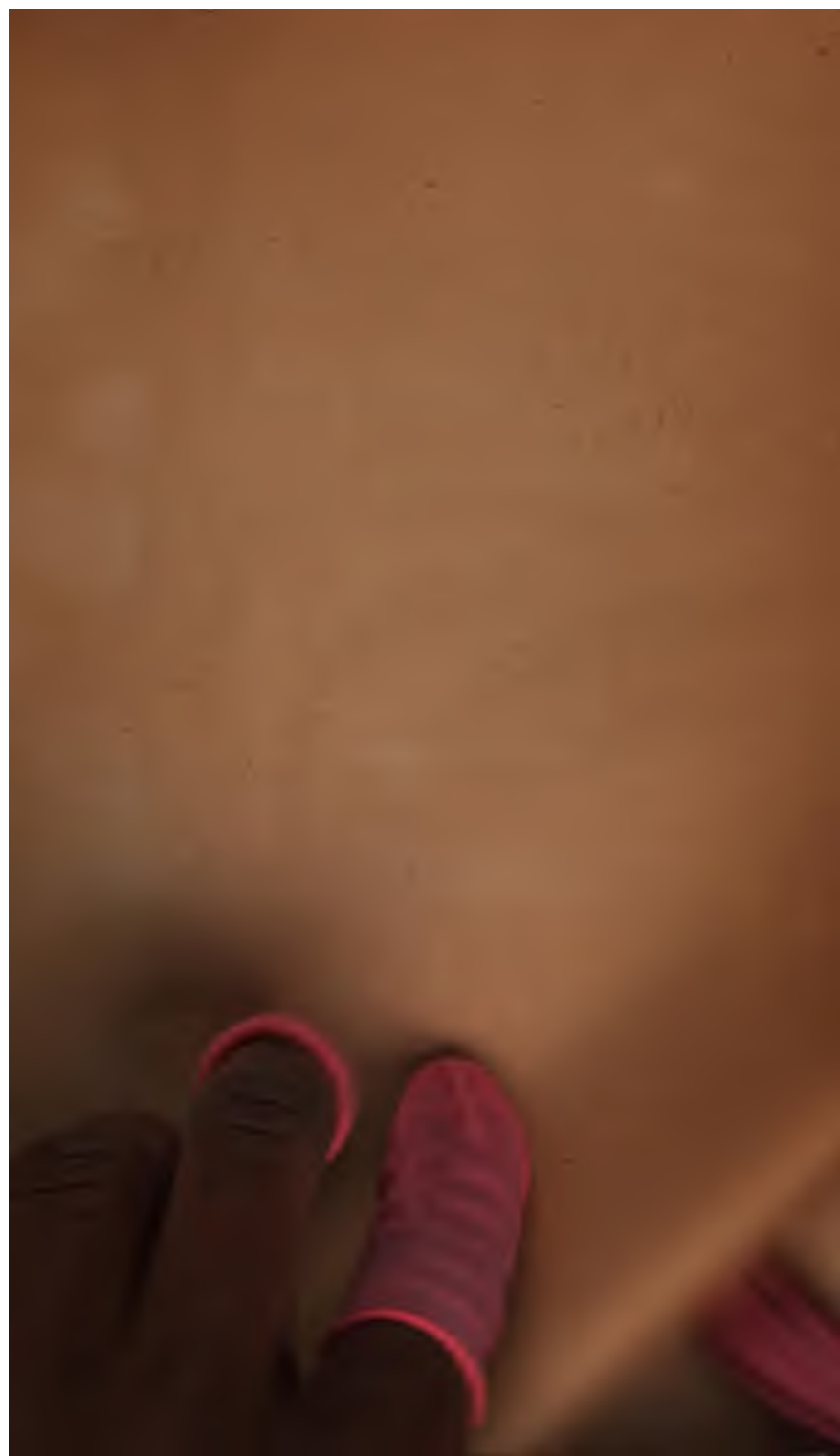




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A  
**Treatise**  
ON  
**CHELTHENHAM WATERS,**  
AND  
**BILIOUS DISEASES;**

CONTAINING

- |   |  |
|---|--|
| 1. General Observations on Fluidity, Mineral Waters, and Watering Places.                   | 5. The Modes of Administering the different Waters.  |
| 2. The Situation of Cheltenham, Salubrity of its Climate, and Longevity of the Inhabitants. | 6. The Diseases in which the Waters are indicated and contra-indicated.                            |
| 3. The Saline Nature of the Soil.   | 7. The Arrangement and History of Bilious Diseases in Britain.                                     |
| 4. The Situation of the Wells, with the Chemical and Medical Properties of their Waters.    | 8. The Description of the Baths heated by Steam, and the different kinds of Bathing at Cheltenham. |

SECOND EDITION,

NEWLY ARRANGED, WITH NUMEROUS ADDITIONS, & TWO PLATES.

BY THOMAS JAMESON, M. D.

OF THE COLLEGES OF PHYSICIANS IN LONDON AND EDINBURGH;  
FORMERLY PHYSICIAN AND LECTURER AT THE  
FINSBURY DISPENSARY, LONDON; NOW  
RESIDENT PHYSICIAN AT CHELTENHAM.

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## PREFACE.

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**CHEL TENHAM** has arrived at that degree of pre-eminence among mankind, that its name has become as familiar in the British East and West Indies, as in London. This has arisen in part from the mildness and salubrity of its climate, in consequence of the shelter it receives from neighbouring hills. But its chief reputation has been derived from the celebrity of its springs, in curing bilious diseases, which the author's experience in tropical climates, has enabled him to explain. He has therefore undertaken to discuss the subjects of climate,



and mineral waters of Cheltenham, together with the means of rendering them most efficient in the cure of all kinds of diseases.

The former Edition of this treatise sold off some time past; and the author, repeatedly solicited for a new one, he only delayed the publication until the various improvements going on at the south side of the town were completed, and a decisive opinion could be formed of their utility from experience; but their having now received the sanction of the public, he is enabled to give the invalid a more satisfactory account of the benefits to be expected from them.

A treatise intended for the public at large, necessarily requires simple language, which should be of an explanatory nature; the introductory pages have therefore been appropriated to the interpretation of technical terms, and to the elucidation of the subject matter of the subsequent chapters.

The observations on climate are peculiar to this edition. Cheltenham has always been experienced to be an uncommonly healthy spot, but the causes have never been properly assigned, from the defect of meteorological observations. The author having kept a register for the two last years, has inserted two tables, from which something useful may be gleaned; at least the opinions he has advanced, and the deductions he has made from them, will in all probability, lead to further investigation of the subject. He was not able to obtain registers of weather for the city of Bath, but has received, since his observations on climate were printed, a meteorological journal for the city of Bristol, kept by Dr. Pole, for the last five years. These compared with the tables in this treatise, make it appear, that Bristol is two or three degrees colder than Cheltenham, in every month of the year, while the latter place is nearly a degree and a half colder than London, in the winter

and summer seasons. At the same time it appears that the annual amount of rain is greatest at Bristol, less at Cheltenham, and much less at London than at either of the other places.\*

But the description of the mineral wells, and the properties of their waters, are the principal objects of this Edition, intended to relieve the public mind from part of the embarrassment, which has naturally arisen from the sudden increase of wells, apparently with different kinds of water, issuing from the same spot of ground. And the author likewise finding it matter of no small difficulty, to con-

\* Dr. Pole's observations, for five successive years, ending with 1808, were made at 8 o'clock in the morning, in St. James's Square, Bristol.

The degree of mean temperature for 1808, at Bristol, 46°. The inches of rain 32.8.

The degree of mean temperature at Cheltenham, 49° 7'—inches of rain 28.53.

## PREFACE.

ix

vey distinct information to strangers, concerning so many mineral wells, either anonymous, or known by different names, that he judged it expedient to add to description, a view of their situation, in a plate at the beginning of the treatise; which, at the same time, by demonstrating the many new buildings and recent improvements in different parts of the town, may become acceptable to the community at large.

A BRIEF HISTORY of the origin, and progress of the mineral wells, at Cheltenham, will give the reader a general idea of the nature of the waters, and will greatly facilitate the plan of discriminating between them, in the subsequent pages.

The discovery of purging saline water took place about a century ago. Mr. Mason, proprietor of a field south of the Chelt, observed

that it contained a spring of peculiar character, and that pidgeons flocked to the spot, to peck calcareous particles from the blue clay, for the digestion of their food. In the year 1718, he railed it in, and his successor, Captain Skillicorne, in the year 1738, erected an adjoining pump-room, with a dome over the well, ornamented with a pidgeon at each corner, and planted the trees of the upper and lower parades, that now form a towering shade against a vertical sun, and one of the most beautiful walks in the kingdom.

This Spa soon attracted the attention of medical men, who contributed by their writings, to bring the water into notice, but they differed considerably in their accounts of its impregnations. Dr. Short examining the different wells of Britain, in the year 1740, praised it highly, as an excellent purging chalybeate, taken in doses from one to three pints; and

observed that soon after its establishment, it had been recommended by Doctors Baird and Greville.\* C. H. Senkenberg, from his experiments made at London in the year 1741, denied that it had any chalybeate properties.† Dr. Lucas remarked, that it contained iron, which invigorated the habit, at the time it proved purgative; and that old men drank it by the quart. Dr. Rutty obtained 528 grains of solid matter from a gallon of water; and observed that it contained sulphur, together with iron; and that the dose was from one to three or four pints.‡ Mr. Barker recommended its use in a prevailing pestilential constitution of the atmosphere.§ Dr. Fothergill analysed it, and called it a purging chalybeate,

\* History of Mineral Waters, 2 vols. 4to. 1740, by Dr. Short.

† Philosophical Transactions, 1741.

‡ Rutty's Synopsis of Mineral Waters, 4to. 1757.

§ A Treatise on Cheltenham Waters, 1786.



which emitted a slightly fetid smell of sulphur, especially after rain.\* And Dr. Smith repeated the observations of Dr. Short and Dr. Fothergill, that the well yielded 35 pints of water an hour, which was not sufficient for three hundred drinkers; and therefore judged it proper to point out three causes of the scarcity: viz. Patients drinking it repeatedly at different times of the day, from a mistaken idea of its proving alterative. Sending for quart bottles-full to their houses, when a pint only was necessary. And taking two large doses of the water, from an impatience under their diseases.†

Our august Sovereign, with his royal family, having drank this water from the 12th of

\* Experimental Enquiry on Cheltenham Waters, 2d Edition. 1788.

† Observations on the Uses and Abuses of Cheltenham Water, 1801.

July till the 16th of August, in the year 1788, on leaving the place, ordered a well to be sunk for the domestic uses of Lord Fauconberg's house, where he resided during his visit at Cheltenham; and instead of fresh water, a saline one was found, of greater strength than that of the original spa. This well, denominated the King's well, yielded such abundance of water for a series of years, that servants drank it, salts were made from it, and horses were supplied with palesful of it, every morning. But having gradually failed for eight or ten years past, it produced so little water at last, that it was shut up two years ago.

When the author settled in Cheltenham, in the year 1802, both these wells, evidently in a state of decay, were drank out every morning, in an hour and a quarter; and the supply of water was totally inadequate to the increasing number of visitors. This scarcity, announced in the daily prints, and severely

felt by many who travelled hundreds of miles to Cheltenham without obtaining their object, whilst at the same time alarms prevailed generally among visitors, that the wells were supplied with water from the river Chelt, determined the author to search for new springs in the south side of the town.

After examining the mineral springs all over the country, and investigating the soil round Cheltenham, by boring in more than forty different places, he had a well dug in the summer of 1803, eighteen feet deep, at the bottom of the lane leading to Badgeworth, and within a hundred yards of the original spa, from which he got an excellent chalybeate saline water; but yielding no greater quantity than twelve gallons in twenty-four hours, he opened a new one at the top of the same lane, forty feet deep, which afforded such abundance of saline waters, that he obtained leave from Lord Sherborne, (lord of

the manor), to erect a new spa upon the waste lands, and published the first edition of this treatise, stating his experiments on the soil, the discovery of new springs, and the certainty of supplying Cheltenham with as much saline water as could be consumed, by any increase in the number of visitors.\*

A building being erected over Lord Sherborne's well, it was opened for the use of the public, in August 1804 ; and the water soon acquired a considerable degree of reputation. At this time, several hundred acres of land belonging to the Reverend Mr. De la Bere, adjoining the well, were brought to the hammer, and sold at an advanced price, and a general rise of property immediately succeeded.

The author having now no connection with any well, nor any predilection for one of the

\* Dr. Jameson's Treatise on Cheltenham Waters, and Bilious Diseases, 1803.

wells more than another, but as it may be suitable to the cases of patients, his opinion concerning their waters, must be considered as completely unbiased by any interested motives.

Henry Thompson, Esquire, the largest purchaser of the De la Bere property, immediately directed his attention to digging more wells in the upper corner of the field, now called Montpelier Grounds; and succeeded in establishing two new ones, close to Lord Sherborne's well. Since which, the Reverend Mr. Nash Skillicorn, proprietor of the original spa, has opened several others on the west side of Badgeworth road.

All these wells supply waters with one leading feature, although there is some variety of character in every one of them. They contain a larger proportion of Glauber salts, than most other wells in the kingdom, which generally derive their cathartic properties

from Epsom or sea-salt. And they acquire a variety of other impregnations, from the circumjacent soil containing different proportions of pyrites, sea-salt, and animal spoils, anciently entombed in the valley by the waters of the boundless ocean. Hence we often find three different waters in the same well; briny at the bottom, sulphurous and chalybeate in the middle, and fresh at the top, according to the difference of specific gravity in the fluids, and their mode of trickling into the well, from different parts of its sides.

In many places about Cheltenham, particularly in the low lying lands, the soil is intimately blended with oxid of iron, without containing any considerable quantity of saline matter, or pyrites; which has given birth to a different species of water from those already noticed. The first well of this kind at Cheltenham, was instituted by the late Mr. Crick-



shanks, chemist, to the board of ordinance, in a field of Mr. Barret's, near the top of the town. Since which, two others of the same kind have been opened in Cambray; and these simple chalybeate waters have proved of considerable use to invalids, conjoined with a course of the chalybeate saline ones, from which they differ essentially; and the author must caution strangers not to mistake the one for the other, which he has known to have occurred several times.

The chapter on bilious diseases has been greatly enlarged, from the many opportunities the author has lately had of observing the character they generally assume in Britain. It was not without regret, that he found himself under the necessity of treating their history more medically, than is usual in popular works, but he could not neglect the favourable opportunity of communicating his sentiments upon a

subject, which has become of the utmost importance in modern times.

The latter part of this Edition is intended to give a general idea of the manner of heating the new baths by steam, and to make the invalid acquainted with the different modes of bathing; since there is little doubt but the practice will obtain generally, among the visitors at Cheltenham, when the conveniency of the baths is sufficiently known, and the utility of warm bathing in bilious diseases is well understood. The connection between the stomach, alimentary canal, and skin, is so intimate, that the external application of hot water relieves cholics, constipations, &c. and promotes the flow of the biliary secretion.

The additional experience of the author, since his first publication on the waters, induces him, more strenuously to renew his cau-

tions to the public, with respect to the indiscriminate use of calomel, James's powder, and Cheltenham water, so frequently abused at this watering place. The more powerful any remedy is, the more liable it is to be misapplied.

Many individuals are in the daily habit of taking *calomel pills* at a guess, and think the practice safe, if they possess the recipe of a physician, who prescribed it on a former occasion; which is often followed by dangerous consequences. Calomel, without doubt, is one of the most useful articles of the materia medica in numerous diseases, and the prejudices of bilious patients in its favour, rest upon the most solid foundations. Mankind, however, are not generally aware, that its valuable properties depend upon its activity in the human system, and that it cannot be taken in repeated doses, by persons exposed to the uncertain

weather of a British climate, without a considerable degree of danger. The continued use of mercury brings on an inflammatory state of the body, and by stimulating the secretory vessels in every part of the system, renders the patients extremely liable to get cold from the usual variations of our atmosphere. In tropical countries, where the weather is uniformly warm, it may be taken every day for weeks or months together; but in this climate, the same habits would ruin the best possible constitution. The author has known gentlemen in the East Indies take calomel every night and morning, for liver complaints, until they had taken to the amount of a hundred grains, without experiencing any inconvenience from it, who could not bear twenty grains in this climate, without affecting the mouth; which is a symptom that generally renders confinement to the house a necessary expedient, to avoid the danger of getting cold.

No remedy can be more unsafe than *James's Powder* indiscriminately used. The inventor, Dr. James, administered it in doses from three to seven grains, or at most ten grains; and always recommended the utmost caution in the employment of it: whereas many invalids come to Cheltenham with debilitated constitutions, and with organic diseases of the internal viscera, who from impatience under their affliction, consent to take James's powders in such large doses as to produce violent vomiting and purging. This at times affords them temporary relief, but it generally aggravates these diseases, and in the hands of the ignorant, is liable to kill them, by persevering in its use.

The imprudent use of *Cheltenham water* occasioned an eminent physician to calculate, that a third of the whole number of drinkers at that watering place, was hurt by persever-

ing in the purging plan.\* The author of this Treatise has saved many persons from fatal dropsy, by preventing their drinking at the wells, when œdematous swellings appeared in their feet, accompanied with debility of the absorbent system. It is not uncommon for persons to commence a course of purging, merely from a supposition that they are bilious; and for those that are really bilious, to persevere in a free use of the waters, without knowing to what extent they can be taken with safety. But prudence requires that invalids should always be directed, before they drink the water, whether they are to pursue the laxative, or purging plan, and what kind of water is best suited to their case. And after they have drank them a certain time, it would be proper to ascertain with accuracy, whether

\* Dr. Saunders, in the preface to the Third Edition of his Treatise on the liver,



changes have not taken place in their constitution, or their disease, to interdict the further use of the waters,

## CONTENTS.

### CHAP. I.

#### ON FLUIDITY, MINERAL WATERS, AND WATERING PLACES.

All waters derived from the ocean—Their accumulations—soft, sea, pump, petrifying, thermal, and *mineral waters*.—Impregnations of gases, salts, and metals—dilution—temperature—change of air—exercise—relaxation of mind—regular habits—confidence in natural remedies. Page 1. to 33.

### CHAP. II.

#### SITUATION OF CHELTENHAM, SALUBRITY OF ITS CLIMATE, AND LONGEVITY OF THE INHABITANTS.

Situation—number of inhabitants and visitors—composition of the Cotswold hills, height, climate—the *climate* of the valley—forest of Dean—general

prevalence and properties of easterly winds, of westerly, of north, of south winds--effects of the Cotswold hills, mountains of Wales, and funnel-shape of the valley, upon the climate--coldness of westerly winds--purity of the air--meteorological tables of the monthly, and diurnal mean temperature--amount of rain--evaporation--state of the earth's surface--*longevity* of the inhabitants--obituary of Cheltenham, of Presbury--*customs* of the people--their habits of living in the open air, little anxiety, temperate life, wholesome diet, regular sleep--their hereditary longevity. Page 33 to 55.

### CHAP. III.

#### SALINE NATURE OF THE SOIL.

Great beds of calcareous blue clay--origin of the mineral waters--found in several different parts of the valley--similarity of their chemical composition--properties of the blue clay--shells--pyrites--salts--artificial water--natural water--general deductions from the geological experiments. Page 55 to 70.

## CHAP. IV.

DESCRIPTION OF THE MINERAL WELLS,  
WITH THE CHEMICAL, AND MEDICAL  
PROPERTIES OF THEIR WATERS.

I. THE APERIENT SALINE WELLS, south of the river Chelt, separated by Badgeworth road—*Original*, or *Old well*, situation, quantity of water, temperature, chemical and medical properties, compared with Lemington water.—*Orchard well*: situation, quantity of water, temperature, chemical and medical properties.—*Essex well*—*King's well*, situation, chemical and medical properties—shut.—*Sherborne well*: situation, quantity of water, temperature, chemical and medical properties.—*Montpelier wells*: the *chalybeated saline*; situation, quantity of water temperature; chemical and medical properties.—The *sulphuretted saline*; situation, quantity of water temperature, chemical and medical properties—Compared with Harrowgate water—Pumps in the *Octagon Turret* near the *Gothic cottage*—Ditto at *Hygeia* house.

II. SIMPLE-CARBONATED CHALYBEATE WELLS, adjoining the river Chelt.—The *Original Chalybeate Spa*: situation, quantity of water, temperature,

chemical and medical properties—compared with Tunbridge water—two carbonated chalybeate wells in Cambray. Page 71 to 97.

## CHAP. V.

### MODES OF ADMINISTERING THE DIFFERENT KINDS OF WATERS.

- I. THE APERIENT SALINE WATERS; season of the year, preparation, time of the day, dose, concentrated water, temperature, duration of the course.
- II. SIMPLE CARBONATED CHALYBEATE WATERS; the dose, temperature, duration of the course. Page 97 to 110.

## CHAP. VI.

### DISEASES WHEREIN THE WATERS ARE INDICATED, AND THOSE WHEREIN THEY ARE PREJUDICIAL.

- I. THE APERIENT SALINE WATERS; enumeration of the diseases; dyspepsia, eruptions, pimples, desquamations, inflammations, exudations, scrofulous affections, ulcers of the legs, opthalmies, rheumatism and gout, asthma and cough, female diseases, piles, gravelly disorders, and worms—*counter-indi-*

## CONTENTS.

xxix

indicated in several diseases, and of ambiguous use in others.

**II. SIMPLE CARBONATED CHALYBEATES**—indicated in debility of the digestive organs, of the uterine vessels, convalescent states, nervous disorders, spasmodic diseases, inflammations of the eyelids—*counter-indicated* in inflammatory diseases, visceral obstructions, determinations of blood to the head and lungs, dropsies, and calculous diseases. Page 110 to 141.

## CHAP. VII.

### AN ARRANGEMENT AND HISTORY OF BILIOUS DISEASES IN BRITAIN.

**I. DISEASES OF THE LIVER**—its structure, active inflammation, chronic inflammation, indurations, suppurative states, torpor, congestions of the sanguineous, serous, lymphatic, and bilious kinds—various organic affections discovered by dissections.

**II. DISEASES WITH DERANGED STATE OF THE BILE.**  
—Properties of bile—diseases with *increased flow of bile*—bilious state of the stomach, sick headach, cholera morbus, bilious diarrhea, dysentery, bilious fevers—diseases with *diminished flow of bile*—dyspepsia, hypochondria, mania, chlorosis—diseases with *obstructed bile*—jaundice.—The passage of biliary concretions—diseases with *vitiating bile*—

The variation of bile in consistence, colour, bitterness, and in disposition to concrete—constitutional tendency to specific diseases in hot climates explained—bile found acrid, fetid, and putrid in many diseases. Page 141 to 186.

## CHAP. VIII.

### ON THE BATHS, AND DIFFERENT KINDS OF BATHING AT CHELTENHAM.

Description of the new baths—the steam apparatus which heats them—utility of the plan—bathing in general—for cleanliness; as a luxury; to strengthen the skin; the practice in Russia; and to cure diseases—different kinds of bathing; the cold bath, shower bath, tepid bath, hot bath, vapour bath, dry pumping, hot air bath; bathing at different ages. Page 186 to 220.





## ERRATA.

Page 7, line 3, for *animal* read *annual*.

Page 24, line 22, for *the fountain-head*, read *home*.

Page 24, line 27, for *a celebrated watering-place*, read *the fountain-head*.

Page 51, line 22, for *British*, read *Bristol*.

Page 53, line 11, for *clear*, read *clean*.

Page 190, line 14, for *Colonel Johnston*, read *the Honourable Basil Cochrane*.

## CHAP. I.

### GENERAL OBSERVATIONS

ON

FLUIDITY, MINERAL WATERS, AND WATERING  
PLACES.

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#### SECT. 1.

ON FLUIDITY.

**THE** afflux of water to any particular spot, depends chiefly upon the latitude, the exposure and situation of the place with respect to the winds and seas, the degree of elevation of the land, and the nature of the soil and subsoil which compose the surface.

The ocean is the original source of all waters on the surface of the globe, and fresh water is derived from it, not by filtration through the pores of the earth, but by evaporation, in consequence of the action of the sun and air upon it.

The watery vapours ascending, principally from the ocean, and in a small degree from the land, form clouds in the atmosphere, which are

transported by the winds to the tops of mountains, where they are robbed of their caloric, and precipitated in large drops to the surface of the earth; therefore winds that blow from the sea over mountains, generally render the adjacent lands watery, and the south-west winds, which bring moisture from the Atlantic Ocean to the mountains upon the western coast, produce the greatest quantity of rain, and the most frequent storms of the island of Great Britain.

The water thus collected, is returned to the great abyss from whence it came, by means of rivers, flowing from the higher to the lower grounds; which in turn give birth to springs and wells upon the plains. The benevolent Creator of the Universe hath therefore supplied every country, of any great extent, with chains of mountains; which are situated for the most part near the sea, upon the western boundaries of continents\*; and rise steeper on one side than on the other, more effectually to distribute their waters, and to extend their benign influence over the face of the earth. The higher the mountains rear their lofty heads, the more rain they con-

\* This proposition is fully established by Mr. Arrowsmith's New charts of the four quarters of the globe; which exhibit the great ranges of mountains situated upon the western continents, near the sea.

dense; hence there falls double the quantity of rain at Kendal and Glasgow, on the western coast, than there does at London or Edinburgh, upon the eastern coast, of this island.

The state of the earth's surface has also great effect in augmenting the proportion of its water. Trees bring rain; and clearing a country from its wood, lessens the quantity of its vapour, and permits the solar beams to exert their influence on the land; hence cultivation has always been considered as the best means to render a country dry, as well as warm.

The different dispositions of the soils themselves, to retain or part with their humidity, and render situations watery, is so universally understood, as hardly to deserve attention in this place.

Sand having less attraction for water than any other earth, permits the water to penetrate between its particles, so as to leave the surface of the land dry; and a chalky soil greedily absorbing water, from its saline nature, is apt to be carried into the earth and appear in the subsoil: whereas, clay forming a chemical union with water, is rendered extremely adhesive and retentive of moisture.\* Therefore soils in general retain a full third of the water which falls on their surface, and permit two thirds to pass under

\* Bergman says clay absorbs ten times more water than sand.

ground; but when a tenacious clay forms the subsoil, the vegetable mould is apt to be supersaturated with water, which cannot penetrate through the clay.

While the rain from the atmosphere flows in the upper strata of the earth, it is fit for the nourishment of animals and vegetables, and becomes accumulated in cavities or wells, which collect water immediately from the strata around them, and therefore are liable to become dry in the summer season; but when rain descends by dykes and vertical fissures to great depth in the earth, it is collected in reservoirs, and returns again to the light of day in a gradual manner, at all seasons of the year. Waters thus coming from considerable profundity, are apt to be mineralized, and thereby less suited for the nutriment of organized beings; but are intended by the Author of Nature for the important purpose of recovering the health of the human species.

Streams of water, passing with great force in the interior of the earth, and sometimes making irruptions upon miners, depend upon the great law of hydrostatics, which raises fluids to the level from whence they came; for the pressure of the atmosphere cannot be excluded from the interior of the earth; being a porous body, which has the looseness of its texture increased by the

numerous vermin inhabiting it, by various gases escaping from it, and by water dissolving its substance, as well as by the many fissures which naturally exist in its most insoluble and indurated materials.\*

**SOFT WATER**, the immediate product of evaporation from the sea and land, would fall in the form of rain, hail, or snow, through the atmosphere to the earth in a pure state, if it did not imbibe some particles of extraneous matter in falling through a vitiated air; but from its affinity to most substances in the earth, it comes from thence always more or less changed.

It dissolves the adventitious bodies it every where meets with in the storehouse of nature, in a way peculiar to itself. Its elements are not separated, but it unites with them in its entire state; for which reason it is commonly said to dissolve them. Sometimes it combines with substances of the animal and vegetable kingdoms, which are apt to render it putrid; at other times it unites with salts and metals which mineralize it, and render it hard. It frequently becomes

\* The elasticity of the earth, derived chiefly from its humidity and loose texture, is observable in the rattling of our windows when a carriage passes at considerable distance in the street.

again soft on exposure to the atmosphere, by immediately depositing these extraneous bodies which it held in solution; hence the water of rivers, lakes, and ponds, is for the most part soft. At other times it conveys the mineral salts to a considerable distance, and meeting with matter of new attractions, deposits them in a crystallized state in the strata of earth, and in the crevices of rocks; from whence they are taken up by passing rills of water, as shall afterwards be noticed with regard to Cheltenham waters.

All other species of natural waters not formed from rain, hail, or snow, are mineralized; but they are not numerous, for we can reduce them to the following kinds.

**SEA WATER**, the most plentiful fluid in nature, is also the most useful one. As those minerals which are of greatest utility to the inhabitants of the earth, exist most abundantly near its surface, so sea salt and iron, the elementary principals of most medical waters, are the most common of all mineral substances on the surface of the globe; and the human race is instinctively directed by the palate, to the use of that which constitutes the thirtieth part of the boundless ocean; on account of its being necessary for the digestion of the food, and as a sti-

mulus to the excretory organs of the human body.\* Sea water, besides supplying most of our animal rain, gives birth to salt springs and lakes, and to most of the impregnations of mineral wells.†

It receives transparency from the great quantity of earthy salts contained in it. The rays of light pass deeper into it than they do into distilled water, from the density of its particles being increased by the salt. Divers can see at a great depth in the ocean: and sailors often receive warning of the bottom of the sea, when they cannot obtain soundings with a deep sea line of an hundred fathoms. It was formerly supposed that water took bodies into its pores without increasing its bulk, because it can be saturated with a great number of substances, one after another, without apparent increase of volume; but the Bishop of Landaff, in his valuable essays on chemistry, has plainly proved the contrary. It is a chemical union, which augments both the bulk and weight of the water, in proportion to the degree of its impregnation: hence the

\* Marine salt is the most universal article of commerce in the world.

† Mr. Scheele obtained glauber salt, at a low temperature, from a mixture of sea and Epsom salts, contained so abundantly in the water of the ocean.



gravity of mineral waters has always been taken as a criterion of the quantity of foreign matters they contain; making a small allowance for the airs, which are sometimes in such proportion as to diminish their weight. It is this increase of density, from the union of salts, that raises the boiling point of water according as the solution approaches to full saturation; and renders the mineralized waters more lucid and transparent than others.

Sea water taken internally proves purgative; but is not in great esteem for that purpose, on account of the heat and thirst it occasions. It is therefore never prescribed in inflammatory diseases, but only in those cases of scrofula and debility, which require the combination of its irritative and cathartic powers; hence, also, it has often more effectually removed the tape worm from the human body than any other remedy.

**PUMP WATERS**, collected chiefly from the upper strata of the globe, are rendered hard by the earthy salts they contain; this arises from an insipid selenite (called *gypsum* by the ancients), composed of sulphuric acid and lime, which proves the most universal of all the causes of their hardness; but it may easily be separated.

#### ON FLUIDITY.

from them by boiling, as we perceive, by the incrustations which spontaneously take place on the inside of our tea-kettles. On account of soft waters abounding more than others with animal and vegetable substances, those which are hard have less tendency to putrefaction, are in general clearer than the soft ones, and they render vegetables crisp and green by boiling.

Notwithstanding water drinkers prefer hard waters to those which are soft, on account of their transparency and coolness, they have their disadvantages. They often taste flat, and sometimes produce uneasiness at the stomach: But there is no reason to accuse them of producing chronic diseases, since selenite is so insoluble in its nature, as in all probability to pass by the bowels, without mixing with the human fluids.\*

**PETRIFYING SPRINGS** derive their properties from an acid or alkali dissolving calcareous or siliceous earth in water. These waters suffering decomposition, permit the earthy matter sometimes to be deposited upon the surface of solid bodies, in such a manner as to leave their internal organization intire; at other times, after carrying off part of their fibres, fill their pores so completely with earths, as to

\* Selenite requires 500 times its weight of water to dissolve it.

obliterate their structure, and leave only a stone, with the figure of an organic body. Most of our warm waters, as Matlock and Buxton, are of this kind.

Petrifying waters have been reckoned improper for drink, by producing stone or gravel, but the living machine has the power of counteracting every chemical and mechanical property of matter; so that these waters may be used as common drink with as much safety as any other species.

**THERMAL WATERS** are not numerous in this country, and seldom contain much impregnation; but they are valuable on account of their hot temperature.

Cold springs, which derive temperature from the atmosphere, vary little in the same latitude in different times of the year, provided they be situated deep in perpetual shade, and remain undisturbed by combustion. As their temperature is of a mean between summer heat and winter cold, every degree of latitude produces a degree of difference in the temperature of springs; hence the amount of annual heat of climate has been more frequently estimated by the springs of a country, than by any other means.

But the temperature of many thermal springs exceeds the medium heat of both the atmosphere and the land. The waters of Bath possess from 107 to 116 degrees of heat, as they come from the spring. Those of Buxton, 82; of Bristol, 74; and of Matlock, 66; they must, therefore, derive their heat from combustible bodies in the bowels of the earth.

Many thermal waters certainly proceed from subterraneous fires, at great depth in the earth, which convert the portions of water next them into steam. This vapour penetrating the incumbent strata, is condensed to the state of boiling water, and accumulated in reservoirs, from which it makes its way gradually to the light of day; and proves of different temperatures, according to the distance it has penetrated.

The waters of Bath have flowed for ages, with undiminished heat, which nothing but subterraneous fires, that burn for centuries, can account for; and at Iceland the water is ejected boiling hot, in irregular columns, and with convulsive motions, only to be ascribed to the irresistible powers of steam.

The next species of natural waters, the more immediate object of this Treatise, shall have a more particular consideration than those enumerated.

## SECT. 11.

## MINERAL WATERS.

They partake of impregnations, in addition to those usually contained in pump water, which have given great variety of character to the different wells of these dominions.

They have been usually divided by their chemical properties into saline, chalybeate, and sulphureous waters; but hardly any of them possess a simple character, for they approach each other in a gradual manner, both in the quantity and quality of the ingredients they contain. It might, perhaps, be better to distinguish them by their medical properties; such as, diluent, cathartic, tonic, diaphoretic, and astringent,\* which would express their principal effects on the body; a more essential object of consideration, than any scrupulous inquiry into the causes of these effects: because chemical knowledge must ever be subservient to medical, for the purposes of the human body.

\* The operation of mineral waters may be explained as follows: *Thermal*, as Bath, Bristol, Buxton, and Matlock, are *diluent* and *diaphoretic*; the sea, Epsom, Nevil-holt, St. Chad's, and Egnigge, are *cathartic* and *diuretic*; Tunbridge is *tonic*; Cheltenham and Scarborough are *cathartic* and *tonic*; Harrowgate, Moffat, and St. Barnard's, are *alterative* and *detergent*; and Hartfel is *astringent* and *detergent*.

Out of one hundred and thirty mineral wells in Great Britain, and thirty in Ireland, not more than twenty are much resorted to, or held in great estimation for the cure of diseases, although the greatest number of them might have acquired equal reputation with the few established ones, had they been brought into use: so much depends upon situation, and the caprice of fashion, to establish the fame of watering places.

The IMPREGNATIONS of mineral wells are not very numerous. They do not exceed forty, and no mineral water contains more than eight or ten different ingredients, half of which have no salutary action on the human body, as far as we know; but taken in the aggregate they are of great importance in the cure of diseases. One or two always give the water its principal character; but the effects of several ingredients collectively, are different from what could be expected from the knowledge of their virtues singly. For instance, the operation of Cheltenham waters upon the bowels, is much easier, and more powerful, by the union of the Glauber, Epsom, and common salt contained in them, than could be experienced from a solution of any one of these salts, taken in a

larger proportion than the aggregate of the three. Bodies are so changed in their properties by new arrangements, and chemical analysis is so intricate a subject, that it is doubtful whether we are acquainted either with the entire ingredients, their accurate proportions, or the state of their combination in any mineral water yet examined. The author has had frequent opportunities of observing many different results in the number and quantity of impregnations from the analysis of Cheltenham waters, by chemists of first rate abilities, from all parts of the kingdom. This is, perhaps, the chief reason why mineral waters, drank in their native state, are more effectual in the cure of diseases than the most skilful imitation of the chemist's art can possibly make them. The following impregnations are of most consequence as articles of the *materia medica*.

I. GASES, of various kinds, are contained in natural waters, either in a combined or loose state. In their loose state their affinity for water has less force than their elasticity, so that it is with difficulty they can be retained in it. They fly off by alteration in the pressure of the atmosphere, or by the smallest increase of its temperature; and both barometrical and thermometrical observations are required to ascertain

the relative quantity of airs in waters. The following are most commonly found in mineral wells.

*Oxygen Gas* (Pure Vital Air), exists in some waters in inconsiderable quantity, but is incompatible with iron or hydrogen gas.\* It adds to the stimulating and exhilarating powers of the water upon the body.

*Atmospheric Air* exists more or less in every species of water, except that which is newly obtained from the still; animals could not otherwise live and breathe in the sea and rivers, nor would they die immediately by immersion in distilled water, but its proportion seldom exceeds an 18th part of the water.

*Carbonic Acid Gas* (Fixed Air), so abundantly produced from lime stone, every where in the earth, exists in almost all waters. It unites with the earths and metals as a weak acid. Some waters contain more than their own bulk of it; and when superabundant, it gives the water a sparkling appearance during its escape. It is the only gas whose medical properties in water have been duly ascertained. It acts as a saline substance in promoting the secretions; but is apt to produce giddiness and headach, when

\* Thomson's Chemistry, Vol. IV. p. 188.



the water contains it in excess : which effect is so great at times, as to prevent the patient from taking a full dose of the water. As a grateful acid, it has long been employed, in a separate state, to check vomiting, and to obviate putrescency of the system.

*Sulphurated Hydrogen Gas* (Hepatic Air), formed by the decomposition of pyrites and water, abounds in particular springs, known by the name of Hepatic, or Sulphureous, especially those of the thermal kind. Water is capable of absorbing this gas in larger proportion than its own bulk, but it gradually separates from the water, or becomes united with an alkaline or earthy basis, and the hydrosulphuret of lime is the most frequent ingredient of hepatic waters. It possesses many of the chemical properties of acids, and it precipitates metals by the hydrogen abstracting oxygen from them, while the sulphur combines with the metal.\*

Taken internally it acts powerfully on the skin, and kidneys, although the operation on the body has not well been explained. It has been employed

\* The incompatibility of the existence of sulphurated hydrogen gas together with metals in water, does not apply to iron, for it unites with the oxid of iron, and forms a hydrosulphuret, which may remain a considerable time without precipitation in water, which is particularly the case with some of the Cheltenham waters.

with greatest advantage in the cure of cachexies. It also kills worms; and, externally applied, cures cutaneous diseases.

*Azotic or Nitrogen Gas* (Mephitic Air), produced from the decomposition of animal substances and atmospheric air, exists in some springs, particularly the Buxton and Harrogate; but it has such feeble adhesion to water, that it cannot be retained in it; hence, in passing off, it increases the sparkling appearance of the water; but there is little reason to regret this volatility, since we are not acquainted with any salutary properties that it exerts upon the human stomach.

II. SALTS exist in all mineral waters. Indurated bodies, which, in their simple state are of an insoluble nature, unite with water, by means of oxygen or carbonic acid. A law of chemistry is, that every substance must be converted into the nature of a salt before it becomes soluble in water. Thus magnesia, in its pure state, is insoluble; but when united to carbonic acid, it readily combines with water. Another law is, that bodies only unite chemically with one another in determined proportions; thus iron is rendered soluble, by acquiring a portion of oxygen; but it becomes again insoluble by an

excess of the same principle: and these laws explain a great many of the phenomena of mineral wells.

The Salts of these waters are in a state of concentration, for the saline matter obtained from them by evaporation, amounts to little more than half the quantity of the same salts obtained in the shops in a state of crystallization; since saline matter takes up nearly an equal bulk of water in forming crystals, which has often led to inaccuracy in stating chemical experiments sometimes performed by evaporation, and at others by crystallization.

*The Sulphuric Acid*, formed from sulphur; and *the Muriatic Acid*, from sea salt; have both great avidity for water; but are never found in it alone; because they always meet with alkalies or earths, to which they unite themselves, and form neutral salts.

*Soda* (Fossile Alkali), the offspring of sea salt, is a common ingredient of waters; but it is generally united to a mineral acid in them. It is sometimes found in hot mineral waters, combined merely with carbonic acid.

*Sulphate of Magnesia* (Epsom Salt), obtained for commerce from the bittern of sea water, is the most common of all the perfect salts in springs, except sea salt, for all cathartic waters contain some of it. It acts on the human

body as a brisk and easy cathartic, and also operates by perspiration or urine, according as the skin is kept warm or cool ; but it gives the water a bitter and nauseous taste.

*Sulphate of Soda* (Glauber's Salt), the combination of sulphuric acid with soda, is the most valuable ingredient of purging springs ; but it predominates only in a few. It is a brisk and easy cathartic, which proves more grateful to the palate than sulphate of magnesia.

*Muriate of Soda* (Sea Salt), is found in almost every water that percolates the earth, and being generally associated, in small quantity, with the two former salts in springs, it in some degree, meliorates their taste, and increases their purgative powers.

Three saline earths are found in mineral waters, viz.

*Calcareous Earth* (Lime), the most important of all the earths to organic nature, is the most common one. It exists generally in waters, and is usually held in solution by an excess of carbonic acid. It has a greater tendency to load the stomach, than to prove a remedy for the cure of diseases.

*Magnesian Earth* (Common Magnesia), exists in the greatest number of springs, and is a useful purgative. The carbonate of magnesia

is almost always accompanied by carbonate of lime.

*Aluminous Earth* (Pure Clay), is found in a few springs, in the state of alum, by combining with an excess of sulphuric acid. There is but one well of this kind in reputation in Britain, which is that at Moffat, in Scotland. Many others might be found, if the water could be used internally in diseases. Eight years ago, the author examined one at Wardrew, near Gilzland in Cumbérland, of an austere taste, and strong astringent nature. The country people were in the habits of resorting to it for the cure of ulcers, by external application,

III. METALS are seldom found in mineral waters, except iron. Copper very fortunately only exists in water near copper mines.

*Carbonate of Iron* abounds in mountainous and marshy situations; and Chalybeates, the most common of all kinds of mineral waters, are easily discovered by their inky taste, and ochry channels, and by exhibiting a shining pellicle on their surface. The iron is generally suspended in the water by carbonic acid; although in a few instances it is held in solution by sulphuric acid; as in alum waters.

The attenuation of iron is not less remarkable

in water, than the extraordinary effects of such a minute portion of matter upon the human body. A pint of Tunbridge water does not contain a fourth of a grain of steel, and yet every portion of the water can be changed to a dark colour by a drop or two of tincture of galls. In like manner, the same small portion of iron taken internally in a pint of water, for a few weeks, constringes and hardens the fibres of the human body. It is therefore employed as a tonic in weak, lax, pale habits, and in chlorotic and cachectic diseases.

Various Muricates, Nitrates, and other mineral bodies are found occasionally in springs, besides those enumerated, as well as some small portions of animal and vegetable matters in a few waters, but they do not give them a medical character, and are for the most part accidental ad-mixtures.

The DILUTING PRINCIPLE, or the watery menstruum of mineral wells, the only one common among them, is perhaps the most important of all their properties, as well in a medical as in a physical point of view. Numbers of facts might be adduced in proof of this. The Matlock water, issuing from the rocks of Derbyshire, is distinguished for being

the clearest water in England, with little impregnation. Bath waters are said to brace the stomach, although they are hot, and contain so little iron, that it cannot be weighed by the accuracy of chemical experiment. We observe daily in medical practice, that the oxyd of iron, administered in doses from two to ten grains, has less effect in curing diseases, than the eighth part of a grain, taken in the minute state of division in which it exists largely diluted in mineral waters. The strongest saline springs contain little above a dram of purging salts in a large dose of water, and yet this produces greater effect upon the body than three times the quantity of the same salt dissolved in a small portion of common water.

In a treatise published by the author fifteen years ago, upon diluents, the salutary effects of simple waters, and the operation of the fluid principle upon the human body, were fully explained. It was then observed, that in the healthy state, liquids were necessary for the digestion of the aliment, and well calculated to lessen the effects of acrimonious matters in the stomach ; to fit the chyle to pass the lacteal vessels ; to give fluidity and mildness to the blood ; and to carry off its saline particles, by the different outlets of the body. In a diseased state they rendered

the small vessels permeable, promoted the secretions, and carried off every putrid and acrimonious principle, generated in the body by diseased action of the vessels. It is by dilution chiefly that we can explain the reputation of many waters and decoctions, which contain the medicating properties in so small a quantity, that their bulk must be of more importance than any specific principle they contain; since the same good effects cannot be obtained by a much larger dose of the same medicine, united with a smaller portion of water.

It was a doctrine of the celebrated Dr. Cullen, that all mineral waters acted on the system nearly in the same way.\*

“ Almost all kinds of mineral waters, whether  
“ chalybeate, sulphureous, or saline, have been  
“ employed for the cure of scrofula, and seem-  
“ ingly with equal success and reputation; a  
“ circumstance which leads me to think that it  
“ is the elementary water that is the chief part  
“ of the remedy.”

The late Mr. Hunter was in the habit of prescribing a large tumbler of cold pump water, to be drank before breakfast every morning, in

\* Cullen's first lines of the Practice of Physic, Vol. iv. page 376.



cases of schirrus and cancer, and no other internal remedy.

Besides these effects of the aqueous principle upon the body, the minute state of division, with which chemical bodies are united to water, renders them more diffusible over the human system, and more active in the bowels, than grosser substances. The effect of the increase of the surface of bodies by minute division is remarkable in quicksilver, which may be swallowed, in its entire state, to the quantity of several ounces at a time, without producing so great an effect upon the body, as two or three grains would do when it is minutely triturated with the most innocent substances.

The TEMPERATURE of the waters occasions a great difference in their character, and is therefore of importance in the cure of diseases. This is a strong argument in favour of mineral waters being drank on the spot, independant of all other circumstances: and it is matter of experience, that the best water drank at the fountain head, even at any degree of temperature, will never have the same good effect in removing diseases, as if it was drank at a celebrated watering place, although a contrary doctrine has been frequently advanced by some late writers. It is a property

of all mineral springs, sheltered from the sun, to be uniform and steady in their temperature. They are colder in summer, and warmer in winter, than all other waters, except the sea : which explains the appearance of smoke frequently seen hovering over springs in the winter season, in consequence of their warm vapours being condensed by the colder state of the atmosphere.

As cold liquids brace the stomach, and warm ones tend to relax it, the colder mineral waters, in the generality of diseases, are drank in the summer season, the better. But, in many cases, where people have not been in the habits of taking large draughts of cold fluids, they should not at first drink them in their coldest state, without caution : on the contrary, in those cases, where relaxation of the body is wanted, it is necessary to drink them hot. Hence arises the great utility of Bath waters in gout, rheumatism, and biliary calculi.

### SECT. III.

#### WATERING PLACES.

These hold forth many advantages to invalids, besides the impregnations, and other properties of their wells. The author has, therefore, long considered the subject of mineral wa-

ters as unfairly represented to the public. Treatises without number have been written upon the chemical properties of wells, which could have no other effect than to display the knowledge of their authors; others have been written upon the medical powers of particular springs, to prove that they cure all diseases by the supernatural powers of their ingredients: whereas, the truth is, the good effects arising from a resort to watering places, depend neither upon the chemical nor medical properties of the springs alone; for a variety of other circumstances operate in conjunction with the waters in the cure of diseases. All kinds of mineral waters, drank upon the spot, prove efficacious in curing diseases, although it is well known that some of them have no more impregnation than common pump water. The great number of cures performed by drinking the *Malvern, Buxton, and Bristol waters*, which contain very little foreign matters, clearly demonstrate that their salutary effects depend on several circumstances, acting in conjunction with the impregnations of the waters; which I shall now endeavour to enumerate separately.

*Change of air* is the cause of many cures performed at watering places. Merely remo-

ving persons with chronic, or obstinate diseases, from one place to another, although the air to which they are shifted may not be so pure as that which they breathed before, has always been considered by the faculty to be of the utmost importance in the cure of diseases; and we have daily proofs of cures obtained in this way, after all other remedies have failed. But when the change is made from a less pure to a more pure air, the chances of recovery must be greatly increased. The author has seen many patients who were in a state of languor, and passed restless nights in London, recover their appetite and sleep, almost immediately on their arrival in the country, from the stimulus of the fresh air.

When we consider that London, in winter, is encompassed with a cloud of carbonic vapour from the chimnies,\* and with fogs from the drains, and the river Thames; that its atmosphere, in summer, is filled with the dust of stones, straw, and horse-dung, and rendered oppressive by reflected heat from brick buildings and stony pavements; we cannot be surprised that its inhabitants endeavour to prolong the span of their existence, by laying in a stock of

\* The dark cloud, composed of unburnt smoke, continually suspended over London, led the celebrated Count Rumford to attempt a calculation of the immense number of chaldrons of coals always floating in the atmosphere.

health from the purer air of country situations, in the summer season.

Impure air seldom arises from the soil itself, unless where there are stagnant marshes. On the contrary, new ploughed ground has been long recommended for the cure of diseases, because it has the property of absorbing all kinds of putrid effluvia from the atmosphere, for the purpose of nourishing vegetable bodies: hence it is, that putrid substances prove the best manure. It is large assemblies of breathing animals—combustion of fires and candles—and masses of putrid substances, where there is no soil to absorb their effluvia—which contaminate the air of cities, and render it necessary for the valetudinarian, and for people with tender lungs, to take refuge in the country.

The effects of odours on the nerves and brain, occasioned Dr. Cullen to observe, in his *Treatise on the Materia Medica*, that those vegetable perfumes which emitted the strongest effluvia, were the most powerful antispasmodics. He therefore gave the preference to assafœtida and musk in curing diseases; and I have little doubt but that perfumes, of the agreeable kind, are extremely friendly to the human frame, and that the odour of a flower garden, new cut hay, or

bean fields in blossom, may produce tranquillizing effects on the nervous system.

As sudden vicissitudes of temperature are neither safe to the health of the human body, nor congenial to the feelings of the skin, rendered irritable by heat, or by long residence in warm climates, the benevolent hand of nature has placed the seasons of the year in gradual succession, and removed the hot and cold countries so distant from each other, as to render transitions from one to the other, safe to the human frame; yet new comers, from the tropical countries, find it necessary to season themselves to the cold of Britain in a still more gradual way, by taking shelter in the warm atmosphere of Bath in winter, and in the salutary air of Cheltenham during the summer season.

*Exercise in the pure air* is another advantage which watering places afford. Very few watering places are in esteem which are unprovided with either variegated walks, or pleasant rides; and when exercise is moderate, regular, and general, it increases the vigour and health of the human system. It produces an equal generation of animal heat, and stimulates the living powers to perform their functions, and

to remove the causes of diseases. But the exercise should be of the most agreeable kind, and that which employs the greatest number of muscles; therefore riding on horseback is to be preferred in most cases; especially in company with agreeable companions. It agitates the trunk of the body, which is of the greatest importance to the health of the machine; and it draws out the mind of the patient from the consideration of his disease, by an attention to the numerous objects around him; both of which circumstances are necessary for its most salutary effects.

*Occasional relaxation of mind* is as necessary for the health of the body, as it is for the happiness of the human species. Continued anxiety has great effect in exhausting the powers of life. In many cases, it brings on diseases; and in others, it destroys the chance of recovery, which particular situations or remedies would otherwise accomplish. It has been found by experience, that transition from home to scenes of a new and pleasing nature, generally has the effect of emancipating the mind from the cares of life, as well as of removing the body from the fatigues of business. Watering places generally furnish various kinds of amusements,

which the inhabitants are solicitous to multiply in every way they can. The libraries supply entertainment in the sultry part of the day, when exercise cannot be taken with pleasure or advantage.

*Regular habits of life* have great effect in preserving and restoring health. Many gentlemen, who are in convivial habits at home, find it necessary to shake them off by an excursion to the country, for the benefit of their health. Ladies, who commonly go to bed at eleven or twelve o'clock at night at watering places, and rise at seven or eight o'clock in the morning to walk to a mineral well, must find it much more conducive to their health, than their habits of late hours in the crowded assemblies of the metropolis, or the neglect of the pure stream of vital air, which exhales so copiously from the vegetable kingdom in the morning.

*Confidence in a remedy* is a principal step towards the cure of a disease. There is a tendency in the human mind to attribute virtues to natural remedies, which it supposes cannot be supplied by art; and to none more than to springs, which have been held in veneration from the earliest times. The expectation that waters



will do good after other remedies fail, is attended with the best possible effects to the patients. Hope must be kept alive in the human breast ; and the sensible qualities, of saltness, temperature, transparency, and sparkling, of mineral waters ; together with the observation of the crowds of people who derive benefit from them, contribute greatly towards the salutary effects they produce. If they had no bad taste nor smell, the patients would have no confidence in their virtues ; and without faith they could not be made whole : because they would not continue long enough in the use of the waters, to give them the fair chance of performing a cure.

## CHAP. II.

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### THE SITUATION OF THE TOWN, SALUBRITY OF THE CLIMATE, AND LONGEVITY OF THE INHABITANTS.

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THE town is situated  $94\frac{1}{2}$  miles, by the Uxbridge road, W.N.W. from London, in the centre of many opulent towns, which encrease its prosperity, and afford the invalids who visit it an opportunity of performing pleasant excursions, in the intervals of drinking the waters.\*

\* Taking Cheltenham as the centre, the bearings and distances of the chief towns from it, by the turnpike roads, from Cary's County Map and Itinerary, 2d. edit. 1802, are as follows:—

Gloicester	$9\frac{1}{2}$ miles	S.W.
Bristol	$44\frac{1}{2}$	S.W.
Bath	$44\frac{1}{2}$	S.S.W.
Monmouth	33	W.S.W.
Worcester	25	N.N.W.
Malvern	22	N.W.
Tewkesbury	9	N.W.
Oxford	40	E.S.E.
Cirencester	16	S.S.E.
Evesham	16	N.N.E.
Winchcomb	7	N.E.

The number of settled *Inhabitants* in the town, when the general Survey was made by order of Parliament, amounted to 2,639. But so rapid has been the encrease, from the influx of tradespeople, chiefly in the building line, and from its lately having become a winter residence for genteel families, that the population of the town, independant of visitors, may now be estimated at 5,000. Thus the dwelling houses in the town were reckoned in the year 1804, at 634: and the number of male inhabitants under sixteen years of age, according to the returns for the militia about the same time, was 2,307, in the whole parish; of which the population of the town is more than four-fifths: therefore, by allowing an equal number of females to males, and half the population to be under twenty years of age, we are greatly within bounds in the above statement.

The encrease in the number of *Visitors* is equally rapid. In the year 1780 they were estimated at 374; in 1790 at 1,100; in 1802 about 2,000; and in the year 1808, were at least 4,000. In consequence of this augmentation, all the houses of the town are fully occupied in the summer season, notwithstanding more than two hundred new buildings have

been added to it, this last year, and a greater number are projected for the one following.

The *Climate* of the county has considerable diversity of character, in situations little distant from each other, owing to its natural division into the Coteswold, or hilly country, and the valley.

The Coteswold country, extending above twenty miles, and into three counties, is separated from the east part of the parish of Cheltenham by a semicircular range of secondary mountains; less than three miles distant from the town. Most of them are cultivated from their bases to their summits, where they become diversified by numerous farms, and extensive sheep pastures. They are composed generally of limestone, red sand stone, free stone, and grit, and in particular places of argillaceous slates, all disposed in beds of horizontal strata, intersected by vertical fissures. On two or three, which have their summits fractured facing the south-west, and also very often in the centre of the mountain, numerous marine shells of different species are discovered, intimately blended with their most indurated materials.\* The stones, which resemble those of Bath, are used

\* Chiefly *Entrochytes*, *Belemnites*, *Ostracites*, *Nautilites*, and *Gryphites*.

for the foundations and ashler fronts of houses, and are so perfectly calcareous, that they burn into good lime for building.

These mountains, elevated 340 yards above the bed of the Severn, have a climate colder by two degrees of latitude, than the valley has. They are therefore disagreeably cold, and frequently windy, for six months of the year; but in hot weather they afford the visitors of Cheltenham refreshing rides, and supply enchanting prospects of the rich and fertile valley beneath. The summit of Cleve Hill, a quarter of a mile from Bernard's Cross, is said to have been one of the stations for carrying on the Trigonometrical Survey of Britain, by Major Mudge. It is elevated 1,022 feet above the level of the sea, and commands very extensive views of ten or twelve counties. In clear weather, Warwick, and Coventry, as well as Gloucester and Worcester, can be seen, and with good glasses the people may be discovered walking at Great Malvern on the face of the Malvern Hills, twenty-two miles distant. The atmosphere of these elevated lands is pure, and the longevity of the inhabitants fully equal to what we find it in the valley.

The valley of Evesham, now more frequently called the valley of Gloucester, is not excelled in beauty and sylvan scenery by any

spot whatever, and receives vivacity from the Severn winding in its centre, and embellishment from the numerous rural villages, and plentiful orchards, which every where adorn its surface.

The Forest of Dean, a part of the valley separated by the Severn, is covered with venerable forests of naval timber, and enriched by coal and iron mines, as well as by many valuable quarries of grey and red grit-stone. These low lying lands near the Severn were formerly considered as unhealthy situations, but since they have been drained, their climate is not less salutary than that of the other parts of the valley. Indeed, the whole vale has a pure atmosphere, and has ever been famed for the longevity of its inhabitants. But the town of Cheltenham is peculiarly distinguished for the salubrity of its situation, and the utility of its climate, to invalids from tropical countries, for reasons which are now to be explained.

The consideration of *Winds* is of first importance in determining the nature of climate in every part of Britain, on account of its insular situation, and the following are the most general circumstances respecting them.

*Easterly Winds* generally blow over the island from the end of February to the begin-

ning of June, with only a few days intermission at a time, but prevail more on the East than the West coast. They likewise blow for a few days about the time of the Autumnal Equinox. They veer to both sides of the East point, but the N.E. prevails most frequently, and this wind coming from the snowy mountains of Lapland and Norway, brings a cold, dry, and dense current of air, which proves extremely noxious to all organized bodies. It parches the human skin, and occasions an inflammatory state of the system, which brings on rheumatisms, intermittents, eruptive diseases, and severe catarrhs. It contracts the vessels of plants, and drinks up their moisture, which renders them sickly, and exposes them to the attack of numerous insects. It is so greedy of moisture, that it raises fogs, in passing over the surface of waters, and divides the fluid particles of the atmosphere, so as to produce continued dribbling rain, instead of heavy showers, when blowing from the S.E.

*Westerly Winds* generally blow more than eight months of the year, most commonly from the beginning of June to the end of February, and prevail particularly upon the West coast. They veer to both sides of the West point, but continue longest in the South West,

Mountains and Headlands not only change the direction of winds, but they also regulate the temperature and humidity of circumjacent countries. Accordingly, near half of the clouds evaporated from the sea, in passing over the mountainous chain which extends along the West coast of Britain, is precipitated near the shores, and the other portion is dispersed over the rest of the island, so that the South West wind supplies most of the annual rain; gales of wind, and thunder storms of this kingdom.

The wind South West, brings heat and moisture from the Atlantic ocean, which destroy the density, and healthy elasticity of the atmosphere. But the wind due West, or veering a point or two to the North West, is generally clear and dry, and brings with it the finest balmy weather of Britain.

The wind due *North*, seldom blows thirty days in the whole year, and coming from the polar regions brings a cold, dry current of air, dense to the Barometer, which braces, and invigorates the human system. Although the weather is generally dry with a north wind, when it happens to rain with the wind in that quarter, it falls in small drops, and often continues a considerable time.



The wind due *South* seldom blows five weeks in the whole year. By proceeding from the middle regions of the globe, it brings a warm, moist, and rarified atmosphere, light to the Barometer, by which means it disengages the effluvia of odorous bodies, produces heavy rain, and debilitates the human system.

These are the states of the weather existing generally over the island, but they are frequently modified by local circumstances, which depend upon particular states of the earth's surface.

The first and most important peculiarity in the site of Cheltenham, is its vicinity to the Cotswold hills, which are of such moderate height, as not to abridge the length of day, and sufficiently elevated, to screen the town from the destructive influence of the bleak East, and cold North East winds, that prevail all the spring of the year, and after the Autumnal Equinox. It is likewise distantly bounded by the mountains of Wales to the West, and the rocky shores of the Bristol Channel to the South West, which have also some influence on the nature of the climate. The valley being open only to the West, and South West points, occasions the West wind to assume a peculiar cold character

at Cheltenham, which in other places is generally mild, and blows in gentle zephyrs. Deprived of its heat in passing the tops of the Welsh mountains, not forty miles distant, it glides along the valley between the hills, producing a sensation of cold nearly equal to that of the East wind. This wind is therefore disagreeable in winter, more especially when veering North of West; but as Westerly winds prevail most in the hottest season of the year, they are, upon the whole, pleasant and salutary breezes.

At the same time, this funnel shape of the valley, with a large river in its centre, elicits currents of air, which ventilate the atmosphere, and contribute largely to the purity and salubrity of the climate. The melioration of climate, from the shelter of the hills, induced the late Benjamin Bell, Surgeon of Edinburgh, distinguished by his writings and extent of practice, to send his consumptive patients to Cheltenham, from an idea that the climate was as mild as that on the coast of Devonshire, and less frequently disturbed by boisterous weather.

The author has always observed that the inhabitants of Cheltenham are little subject to winter coughs, notwithstanding the great number of aged people in the town, and likewise that

epidemics, which rarely appear, do not prevail any great length of time.

The following Table is extracted from two years meteorological Journal kept by the author at Cheltenham, and the observations were taken with the thermometers on the outside of the windows, in a northern aspect, and completely excluded from the direct influence of solar rays. Six's thermometer, which denotes the greatest cold and heat in the observer's absence, was employed for the Tables, but the common thermometers indicate nearly the same mean temperature of the twenty-four hours, if the observation be taken between nine and ten o'clock in the morning.

As the greatest expansion of the mercury in the barometer is not considered to be above three or four hundred parts of an inch from heat, it is of less importance at what hour the remarks are made with this instrument, if it be recollected that in general it is rather higher in the mornings and evenings than in the middle of the day; and the greater height of the barometer frequently observable in spring and summer, arises from the elasticity of the atmosphere, together with its actual weight, being greater at those particular times.

## METEOROLOGICAL TABLE.

	Thermo- meter.	Barome- ter.	Rain.		Snow	Wind.				Thun- der.
YEAR 1808.	Monthly Mean.	Monthly Mean.	Number of Inches.	Rainy Days.	Snowy Days.	No. of Days Westerly.	No. of Days Easterly.	No. of Days due North.	No. of Days due South.	Number of Storms.
January	37.2	29.69	80	8	3	29	-	-	2	-
February	37.8	29.80	20	4	3	22	7	-	-	-
March	40	30.30	03	2	3	2	28	-	1	-
April	46.5	29.71	5.05	10	2	20	6	3	1	-
May	57	29.73	1.30	11	-	25	4	-	2	-
June	60	29.80	5.20	9	-	20	6	1	3	-
July	66.2	29.78	2.50	14	-	14	14	-	3	3
August	63.8	29.73	3.05	10	-	21	4	4	2	-
September	56.5	29.62	3.20	13	-	11	11	3	5	3
October	49.1	29.66	3.90	14	-	23	2	3	3	1
November	46	29.61	2.60	10	-	12	14	-	4	-
December	36.5	29.75	70	5	8	19	7	4	1	-
Annual mean for 1808.	49.7	29.78	28.53	110	19	218	103	18	27	9
Annual mean for 1807.	50.1	29.73	27.05	96	18	213	98	25	30	5

The *Temperature* of the climate has often been canvassed by strangers. Some considering Cheltenham as extremely cold in winter. No doubt the elastic air of an open country town, aided, occasionally, by the diminished heat of the West wind, must be colder than the confined atmosphere of cities, loaded with vapor of chimneys, and of human beings; but this is a pure state of inhalation, which contributes to the longevity of the inhabitants, as might be illustrated by numerous instances of asthmatic people selecting Cheltenham for their winter quarters.

Others have complained of the intensity of the summer heat, but the author observed that the mercury did not rise in the thermometer above 86° at Cheltenham, during the uncommon hot days, the 13th, 14th, and 15th of July last, whereas it exceeded ninety, on the same days, in many other towns, and was as high as 93½ at the Royal Societies House in London.\* These and other considerations determined him to institute a comparison of thermometrical heat for the winter and summer months of Cheltenham.

\* An uncommonly violent storm reached Cheltenham from the East on the night of the 15th, accompanied with excessive rain, hail, and thunder, whereas in London the weather was fair and fine all the time of these hot days.

ham, with those of London ; but it could not be done from the registers published in the Monthly Journals, through the want of correspondence in the hours of observation, and from the latter not being taken at the hottest and coldest times of the diurnal revolution.\* The author therefore applied to Mr. Gilpin, Register of the Royal Society, for the mean temperature of night and day for the year 1808, as indicated by that invaluable instrument, Six's thermometer, who supplied him with every information he wanted, in that obliging manner, which gives him great pleasure to acknowledge ; and it appears from the comparison of mean heat, that London is near a degree and a half warmer than Cheltenham, both in the winter and summer, excepting a few days in June and July, which are hotter in the middle of the day at Cheltenham, than at London.

\* Mr. Gilpin says he has always found the greatest cold of the 24 hours to be at 8 o'clock in December and January, and at 7 the rest of the year ; and the greatest heat a little after 2 all the year round ; which occasioned the publication of the Royal Society's observations at these hours ; but it remains to be determined whether the same thing takes place in the country as in London.

## A COMPARATIVE TABLE

	Days.	1807. Dec.	1808. Jan.	1808. Feb.	1808. June.	1808. July.	1808. Aug.
Cheltenham	1	33	43	45	58	61	68.5
London		36.5	45	50	61.5	61	66.5
Cheltenham	2	38	40	48	57	59.5	64.5
London		40	44.5	50.5	58.5	60	67.5
Cheltenham	3	33	38.5	42.5	58.5	60.5	63.5
London		35.5	38	43.5	58.5	62.5	65.5
Cheltenham	4	44	34	38	57	60	63
London		41.5	37.5	37	59.5	60	67.5
Cheltenham	5	42.5	44.5	44	57	58.5	66.5
London		44	44.5	44	58.5	58.5	69
Cheltenham	6	40	40	43	54.5	59	69
London		40	44.5	44	54	62	70.5
Cheltenham	7	32.5	44	46.5	54	63.5	67.5
London		35.5	45.5	49	58	66.5	66
Cheltenham	8	32	41.5	40	54	64	67.5
London		29	45	41	57.5	66.5	69
Cheltenham	9	31	42	38	54	63	67
London		30	43.5	36	56	66	66.5
Cheltenham	10	26.5	44	32	55	62	66.5
London		29	46.5	32	57.5	66	66
Cheltenham	11	36	44	36	57.5	66	64
London		32	46.5	34.5	60.5	70	67
Cheltenham	12	38	36.5	26.5	58	69.5	63.5
London		40	38	30.5	58.5	76	67
Cheltenham	13	40	36	28	58	77	67.5
London		41.5	40.5	28.5	62	80	65
Cheltenham	14	40	44	25	58.5	75.5	65
London		43	44	27.5	63	81	66.5
Cheltenham	15	30.5	28.5	28	57	75.5	64
London		36	32	28	61.5	72	65.5
Cheltenham	16	34.5	28	36.5	57	74	62
London		39	29.5	37.5	57.5	75	63.5

## OF MEAN DIURNAL HEAT.

	Days.	1807. Dec.	1808. Jan.	1808. Feb.	1808. June.	1808. July.	1808. Aug.
Cheltenham	17	33	28	38	59.5	70	63
London		33.5	31	35	61	72	65.5
Cheltenham	18	34	20	40	59	68.5	60
London		35	31	42.5	68	73.5	65
Cheltenham	19	34	34	36.5	63.5	69.5	63.5
London		36.5	35	38.5	67	76	66
Cheltenham	20	32	34.5	40	64.5	66	64
London		31	39.5	35	68	68	64
Cheltenham	21	30	22	31	67	65	64
London		30	26.5	34.5	64	67.5	67
Cheltenham	22	28.5	38	36	65	64.5	65.5
London		32.5	25.5	36	63.5	66.5	66
Cheltenham	23	24	38.5	36.5	62.5	65	64.5
London		34	31.5	36	62.5	70.5	62.5
Cheltenham	24	30.5	38	35.5	62	65.5	61
London		38	38	38	62	70	64
Cheltenham	25	30	36	31	63.5	65.5	60
London		40.5	37	34.5	63.5	67	63
Cheltenham	26	48	30.5	33	66	66.5	64
London		47	31	33.5	64.5	66.5	64
Cheltenham	27	45.5	32	40	63	65.5	62
London		47	34	43	62	67.5	63
Cheltenham	28	48	42	42.5	60	66	58.5
London		41.5	42.5	41.5	57	62.5	59.5
Cheltenham	29	49	37.5	49	64	67.5	59
London		49	39.5	49	64.5	68.5	61.5
Cheltenham	30	41.5	44		66	60.5	59.5
London		44	45.5		62	69	67.5
Cheltenham	31	45	46			68	60.5
London		42.5	51			70	62.5
Monthly							
Mean for Cheltenham.		36.3	37.2	37.8	60	66.2	63.8
Do. for London.		37.9	38.8	38.3	61.1	68.3	65.5



The quantity of *Rain* is what might naturally be expected from the central site of Cheltenham, between the East and West coasts of the island, there being more than falls on the Eastern, and less than on the Western shores. It appears by the Reverend Mr. Blanchard's Tables, that thirty inches and three quarters of rain fell in 1806, and thirty-one inches and three quarters in 1807, for twelve or thirteen towns equally situated upon the East and West coasts;\* but other authors have reckoned thirty-two inches and a half to be the mean for the whole island.† There generally falls at Kendal on the West coast above fifty inches, and sometimes as much as seventy or eighty in the year, and at London on the East coast, according to the Journals of the Royal Society, there fell in 1807, which was an uncommonly dry year, only fourteen inches and one-fifth of rain, and the number of rainy days were ninety-one; and in the year 1808, eighteen inches and a half with one hundred and twenty-eight rainy days, although in many years it amounted to twenty-two inches or more. Mr. Gilpin has long observed a circumstance which has never been

\* Tilloch's Philosophical Magazine for May 1807.

† Thomson's System of Chemistry, Vol. IV. p. 180, and the 4th vol. of the Manchester Memoirs.

explained, that more rain falls by three or four inches annually in the vicinity of London, within two or three miles, than is collected at Somerset House.

The author is of opinion that the difference in the annual amount of rain at Cheltenham and London, depends upon the showers being heavier, particularly in the night, from the greater proportion of trees and vegetation in the country than in towns; for there is very little difference in the number of rainy days, in these two places.

The *Wind* has always been considered by the author as the leading circumstance of climate and weather, for the rise and fall of the mercury in the thermometer and barometer generally follow the changes in the direction of the wind; but most observers in London are deprived of the opportunity of registering it correctly, from the particular situation of that extended city; and the author has not yet had an opportunity of making any comparative observations with the Table for Cheltenham.

As *Evaporation* is always proportioned to the extent of watery surface exposed to the action of the sun and air, it cannot take place to any great amount at Cheltenham, where there are no morasses nor stagnant pools, and only a small

rivulet on each side of the town, with rapid currents to the Severn.\* There are therefore never any thick fogs, but the author has seen a few dark days called blight, and also a slight haziness in the early part of the day, occurring several times in the year.

The many shrubs and trees, which ornament the valley, are neither so lofty, nor so thick, as to prevent the soil from the beneficial influence of the sun and air, but are sufficiently numerous to exhale an abundant proportion of watery vapour from their surface. This moisture, however, is more than counterbalanced by the quantity of vital air they yield to the action of the solar rays upon them, which contributes largely to the salubrity of the climate.

The adjacent country is far from being a dead flat, since to the North, the East, and the South of the town, the surface is beautifully varied with gradual ascents, and gentle declivities. In short, the town may be considered as resting upon the base of the Coteswold hills, for the water has a considerable descent in its progress to the Severn, which passes through

\* The river Chelt, arising above Charlton Kings, passes on the South side, and Wyman's Brook, arising out of Presbury Hill, near Hewlits, passes on the North side of the town, in their course to the Severn.

Glocester and Tewkesbury in the centre of the valley. It was ascertained a few years ago by Mr. Dadford, engineer, employed in a plan to bring a canal from Tewkesbury, that Cheltenham was elevated above Glocester 165 feet; above Comb's Hill, half way to Tewkesbury 132; and above Tewkesbury itself, 143 feet.

The soil around Cheltenham in some places consists of a brown or blue clay, which are rather wet in winter, but it must in general be considered as a dry soil, containing a great quantity of calcareous matter. The greatest part of the town is built upon a keen sand, and the streets become dry in half an hour after heavy showers of rain; but the roads in the vicinity of the town are pulpy and wet, not from humidity of climate, but from being made with the soft calcareous stones of the neighbouring mountains, and cut up by heavy loads of coal and building materials. This inconvenience, however, will soon be obviated by the rail-way now constructing, which will facilitate the importation of British stone from the river Severn, and render the roads hard and durable.—*Vide Plate first.*

No proof can be more demonstrative of the salubrity of the climate of Cheltenham, than the uncommon LONGEVITY of the inhabitants,

of which some idea may be formed from the following list of all persons, above 20 years of age, recorded on the tomb-stones in the church and burial-ground of that town, lately taken by the author in the year 1807:

	Burials,
From 20 to 40 years of age	195
40 to 60 . . . . .	211
60 to 80 . . . . .	396
80 to 90 . . . . .	47
At 90 and above it . . . . .	15
Total . . . . .	864

This longevity can scarcely be exceeded in any country. More than half the number was above 60 years of age, and 15 out of 864 persons attained the age of 90 and upwards; which is one above ninety years of age in every fifty-seven persons; and nine to six of these were women, which is not perfectly consonant to the received opinion, that females live longer than males, but fewer of them arrive at the utmost extent of human duration.

The result was little different with the author's enumeration of the tomb-stones of the Anabaptist chapel at Cheltenham. The same similarity also occurred at the church-yard in the village

of Presbury, a mile and a half from Cheltenham, except that there were two persons buried above a hundred years of age, and one woman living in the workhouse a century old.

But the climate will not altogether account for the great extent of life so observable in this country; the hereditary stamina of the body and customs of the people must also be taken into consideration.

With respect to Cheltenham, it consists chiefly of one open and clear street, and the lower classes have separate tenements, so that no accumulation of carbonic acid takes place in the air, from respiration, putridity, or smoke, in consequence of dense population. The people in general are robust, and in habits of exercise in the open air, for there are no manufactories, and few sedentary employments in or about Cheltenham. The inhabitants of the town and its vicinity are chiefly farmers, gardeners, builders, labourers, and shopkeepers. Even the visitor and shopkeeper, as well as all other classes of the community, are much in the street; and the town lying N.W. and S.E. the sun crosses the street between eleven and twelve o'clock, so that the houses afford a shade nearly all the day, against the scorching rays of the sun, in the hot season of the year.

The lower classes of the people have little anxious care for the maintenance of their families, and exhibit great indifference about employment. They can live a week upon four or five days work, and are therefore slow, and leave off out-door work when it rains. Their diet is wholesome, and they are rather temperate. The vegetables, bacon, and mutton, are uncommonly good, and plentiful. The people eat moderately of animal food, and drink freely of home-brewed ale and cyder, but little of spirituous liquors, and are seldom intoxicated. They have regular hours for sleep, for they go to bed about 10 o'clock, and rise early in the morning. The farmers and most of the cottagers in the vicinity, are cleanly in their houses and persons, and the same may be said generally of the inhabitants of the town.

It is perfectly obvious, that such habits, with the aid of a salubrious climate, will not only contribute to the preservation of the human system, but will also beget a strength of stamina, which must be transmitted from father to son, in a series of successions, and in time render longevity the inheritance of particular families, a circumstance extremely frequent in the valley of Gloucester.

## CHAP. III.

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### THE

### SALINE NATURE OF THE SOIL.

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THE soil of the parish of Cheltenham, in some places, consists of a loose sand, and in others, of a stiff blue clay. But a peculiar circumstance of the valley, and more particularly of the parish of Cheltenham, is, that the soil in a great number of situations is composed of immense beds of marly blue clay, which extend to great depth under the surface, and become hard and lamulated like soft slate, as they deepen. A great variety of fossil shells are found in this kind of blue clay, and in some particular places it abounds with white particles of calcareous powder, and with crystals of selenitic salts, from which the springs of Cheltenham and its neighbourhood have derived their origin. This kind of soil therefore becomes of considerable importance in the natural history of the place.



An opinion has always prevailed at Cheltenham, that the saline waters come from the neighbouring mountains in a prepared state, notwithstanding the geological experiments published by the author five years ago, which demonstrated that the salts impregnating the springs, exist in the strata of the earth immediately surrounding the wells, and that the mineral wells always take origin in blue marly clay.

Another opinion connected with the foregoing is, that the saline springs in the vicinity of Cheltenham extend in one direction through the valley; to refute which it will be sufficient to give the following brief result of the author's visit in 1803 to wells of this description in almost every different situation.

The *Hyde* spring, in the parish of Presbury, two miles and a half from Cheltenham, and one from the village of Cleeve, consists of a purging water, which was strongly recommended by Dr. Linden, in the year 1750, as equal in efficacy to that of the Cheltenham Spa. It is a saline water resembling those of Cheltenham in taste, and exhibiting the same kind of appearances by chemical tests. It never was brought into general use for drinking, but great quantities of salts were made from it, during a series of years,

by the late Mr. Ironmonger, surgeon. It is now used only to cleanse the milk-pails, and other utensils of the farm.

In *Cleeve* field, near Gotherton, about four miles from Cheltenham, and three to the northward of the Hyde spring, there is a well, about four feet deep, full of high coloured water, exposed to the atmosphere. It is a weak brine spring, containing a large proportion of common salt.

At *Arle*, a mile from Cheltenham, on the South side of the public road, there is a spring of purging water, which rises in a ditch. Dr. Short described it, in the year 1740, to be a bitter, purging water, as strong as that of the Hyde, but not so clear. This water greatly resembles those of Cheltenham, but not so strong, and is altogether neglected.

At the village of *Walton*, about seven miles from Cheltenham, and one from Tewkesbury, there is a well, which contains a purging water, at the depth of 20 feet. The late Dr. Johnstone, of Worcester, described it, in the year 1787, as possessing a sulphureous smell, and containing some iron. He observed, that it sometimes occasioned giddiness of the head, and usually acted like Cheltenham water upon the bowels.

At the seat of Robert Morris, Esq. near the village of *Barnwood*, eight miles from Cheltenham, and one and a half from Gloucester, is a saline well, which was discovered in the year 1802, on digging blue clay, so hard, as to require blowing up with gunpowder. It contains a greater proportion of common salt, to that of the Epsom or Glauber, than is found in the other wells of the vale, and a pint or two proves cathartic.

At *Nanton Farm*, nine miles from Cheltenham, and half a mile from Todington, on the Tewkesbury road, there is a draw well, which contains a great quantity of saline water. It has been noticed above thirty years: and salts were attempted to be made from it, but they proved too black for use.

Although the water was tasteless at the top, on sinking a bottle thirty feet deep, it brought up water which emitted a strong smell of sulphur, and tasted brackish. A quart proves purgative, and it turns black by boiling in metal vessels. It is never used at the farm in the hot season, when the water is low, on account of its saltiness.

At *Walsworth Hall*, the seat of Mrs. Hayward, three miles north of the city of Gloucester, there is a spring, which, forty years ago, was

resorted to on account of its saline impregnations, but is now only used as a watering place for cattle.

At the village of *Stoke Orchard*, four miles from Cheltenham, near the Tewkesbury road, a draw well, forty feet deep, contains saline water, tastes salt, without either iron or sulphur. A pint proves purgative, but it is only used for washing the farm utensils, which it preserves sweeter than other water.

Behind the house of *Mr. Seyle*, of Alstone, a mile from Cheltenham, is a well seven feet wide, and sixty-one deep, which contains a saline water stronger than those of Cheltenham, without iron or sulphur, and contains a great proportion of sea salt.

All these saline springs afforded, with chemical tests, the same kind of precipitations, differing from one another in proportion of ingredients only.

With tincture of galls, they changed in less than twenty-four hours to a greenish coloured fluid, with a shining variegated pellicle on the surface, and a dark brown sediment at the bottom. With acetite of baryte, more or less of a white precipitate was produced; with oxalic acid, a white powder; with pure ammonia, a white

precipitate and film adhering to the glass; with nitrate of silver, a blue sediment; with nitrate of mercury, a white sediment, changing to yellow: with equal quantity of alcohol (of the specific gravity of 0,830) they dropped a white powder; and when added in large proportion to the water condensed by evaporation, they deposited slender crystals. Which experiments I considered demonstrative of the presence of sulphuric and muriatic acids—of lime and magnesia. In short, that selenite, sea, Glauber and Epsom salts, or their elementary parts, exist in the soil surrounding these wells, and that rain or hard water percolating through the tenacious blue clay received impregnations, but of no great variety.

The town of Cheltenham lying upon a bed of sand, is plentifully supplied with common pump water. Springs are every where found at the depth of from ten to eighteen feet, which contains no impregnations of iron, or perfect salts, and are fit for every domestic use.

But on each side of the town, North and South, there are rising grounds at the distance of a quarter of a mile, and not exceeding a hundred feet at the greatest elevation. The soil of these eminences consists of a blue clay or marl, which extends from within a foot or two

of the surface of the land, in one continued stratum, to unknown depth.

The circumstances most observable, are, its growing dryer and harder the deeper it penetrates, so as to appear in some places indurated and foliated like slate. It is nearly as hard as stone at great depth, and sounds hollow when struck with the borer. Ligneous and vegetable productions are seldom found in it, but in one of the high fields some black strata were dug from great depth, which burnt freely, and had all the appearances of coal; which corresponds with the opinion of some miners, that there are beds of coal at great depth, but that they would not pay the expence of working.

When the author dug a well five feet wide, and eighteen deep, near the original Spa, wherein water of a saline, sulphureous, and chalybeate nature was found, he subjected the various matters of the soil, and the water contained in it, to chemical experiments.

The CLAY exhibited a blue colour, and smooth tenacious texture. It adhered to the tongue, and tasted insipid. It was so indurated as to appear glossy, like polished marble, upon being cut with a knife. When dry, the colour became a little brown, and the texture brittle. It was studded with glitter-

ing crystals of salts, distinctly seen with the naked eye, about the size of peas; and with the microscope, in the sun, the salts were discovered to be blebbed, with brown oxyd of iron and blue clay, into one common mass.

This clayey mass efferevaced strongly with vinegar, indicating the presence of earthy carbonates; and in many situations abounded with powdery particles of lime. For these reasons, the inhabitants use it as a manure for the land, and reckon it unfit to make bricks.

To ascertain the proportion of saline matter that the clay contained, a solution was made of a hundred grains of dried clay in an ounce and quarter of dilute muriatic acid, and the liquor filtered from it. The dried residuum was boiled ten minutes in six ounces of distilled water, and filtered again; the remaining insoluble portion, after drying, weighed only 53 grains; which shewed that the clay had lost nearly half its weight. How immense then must the quantity of saline matter be, in so many acres of blue soil on the south side of Cheltenham? The remaining argillaceous earth had lost none of its blue colour. It was uninflamable, contracted in the fire, with a crackling explosion, and consisted of alumine, some magnesia, and a little silica.

The SHELLS were the remains of marine animals of different species, buried at all depths in the soil—some entire, others in fragments; and when dissolved, had left the impression of their form upon the clay. Some possessed all the original characters of shells, with lineaments expressed in the most perfect manner. Others consisted chiefly of indurated clay, and a crystallized matter, the colour of horn, in the form of shells. Many of them were marcasites, exhibiting a beautiful argentine and brassy lustre externally.\* And a few were composed internally of brown pyrites. These extraneous matters, in their fluid state had filled the cavities of the shells, and afterwards became indurated, while the calcareous matter gradually changed to another form.

The species of shells, dug from the blue clay on both sides of the town, consisted of numerous gryphites; entrochytes, belemnites, ostracites, and nautilites.

\* The alchymists considered marcasites as stony matters, receiving colour from different metals; and they distinguished them into gold and silver species. The term is used at present nearly in the same sense as mundic, for the first rudiments of a metal; that is, a mineral containing fewer metallic particles than constitute an ore. The term is often applied to shining fossils, whether they contain metal or not.



The *dentalia*, or tusk-like shells, were very numerous, and always compacted with hard clay. But the *cornua ammonis*, called snake stones, were the most abundant of the whole. They consisted of four spiral and tapering convolutions, rolled in a circle, like a coil of rope. They exhibited striæ on the back, with regular ridges between, and internal chambers, which were petrified with blue clay or pyrites. This species afforded a beautiful variety; for they were of all sizes, from a silver penny to a crown piece, and often possessed different degrees of metallic splendour. Their chemical composition consisted of lime, carbonic acid, and the extraneous matters before enumerated.

The PYRITES (Sulphuret of Iron) were mostly in oval masses, frequently as large as walnuts; at other times, in flat patches, with a smooth shining surface, and brassy appearance; and generally of a pale yellow colour, denoting the species to be a sulphuret of iron, formerly called martial pyrites. They were so hard as to scratch glass like a diamond, and to strike fire with steel. They were brittle, and the fracture discovered metallic fibres converging to the centre. The specific gravity was 3.5. at a temperature of 60°; and when the sulphur was

dissipated by roasting, they lost near half their weight. The remaining metallic matter being dissolved in dilute sulphuric acid, deposited a fourth part of its weight, on adding prussiate of potash.

The SALTS were generally found equally dispersed in the clay near the surface, and proved to be crystallized selenite, which wasted by exposure of the clay to the weather. They had a transparent sparkling appearance, and a texture softer than alabaster. They were mostly of a flat or cubical shape, but sometimes found in tuberculated masses, larger than pease, as if the confinement of the soil had obstructed their crystallization. Their taste was insipid, or rather substringent, and their solubility in fluids extremely difficult; but when reduced to powder, and exposed to a strong heat to expel the acid, they became a white friable powder, soluble in water. This solubility, together with the undisturbed transparency of the solution by adding pure ammonia, shewed the base was not magnesia; and the white precipitate produced by adding oxalate of ammonia, were sufficient evidences of its being lime. The acid was discovered to be sulphuric, by acetite of baryte

producing a deposit of sulphate of baryte, in the solution of the crystal in a large portion of water.

Besides these salts, the author observed in some situations, something like small particles of perfect salts in the clay, which tasted more pungent and soluble than the former, and effloresced by exposure to the air ; but this was not fully ascertained.

The ARTIFICIAL WATER obtained by boiling the clay, and that collected naturally in the openings of the ground, were compared in the following manner.

A pound of clay, taken from the borings in the lane, was boiled in a gallon of rain water for half an hour, to dissolve the salts ; and the liquor filtered.

The clay liquor had a salt taste. The boiling had separated the gases and iron, but decompositions were produced by the different tests, which shewed the presence of lime, sulphuric acid, muriatic acid, magnesia, and soda.

The NATURAL WATER tasted salt, and with the tests, exhibited the same appearances as the clay liquor ; and the former being in possession of its air and iron, turned milky with lime water, and red with vegetable juices, and changed to

dark green, or purple, with the powder and tincture of galls.

Half a gallon of the natural water, evaporated to dryness, afforded 300 grains of residuum, which is more than was obtained from the water of the Royal Spa : and by evaporating 12 gallons to a pint and a half, and cooling it in a shallow vessel, twelve ounces of beautiful large crystals an inch long, of the shape of six-sided prisms, with dehdral summits, were obtained ; which salts were soluble in three pints of water at 60 degrees of heat. These indicated the greater abundance of sulphate of soda, than of sulphate of magnesia or muriate of soda ; which latter would have disposed the crystals to assume more of the quadrangular and cubical forms, and to require a greater quantity of water for solution.

From the whole of these experiments, the author made the following general deductions, and published them in 1803 ; since which they have been amply verified by the general practice of digging saline wells.

1. That the lands on both sides of Cheltenham consists of immense beds of blue clay. Their bases forming an intermediate valley, upon which

the sandy soil of the town rests. This clay does not generally contain crystals of salts, but they never have been found in any other soil than this kind of marly blue clay; and chiefly near the surface; on the south side of the town.

2. That this clay is of so tenacious and indurated a nature, that little water can penetrate through it, unless some change of stratum, fissure, or accidental aperture, from decomposition of chemical substances, permit it to pass. And as none of the wells have been dug beyond the blue clay, the supply of water cannot be so rapid, as with other springs which percolate looser materials, or rise with force from considerable profundity.

3. That native salts, or their principles, exist in the soil immediately surrounding the wells, and the water which dissolves them, comes from the rain falling on the surface. These wells cannot, therefore, interfere with each other at any great distance; and the strength of their waters must vary according to the state of humidity in the earth, particularly when the wells are not deep.

4. That both the clay liquor, and natural water of these experiments, discovered the same kinds of impregnations, as the old Spa did in its

original state, and that the proportion of saline matter was equally abundant in them, as in the established wells, since a single pint of water from the opening in the lane, operated upon the bowels of several persons who drank it.

5. That the decomposition of blue clay, shells, pyrites, and sea salt, relicts of the ancient ocean, give origin to the impregnations of all the aperient waters of Cheltenham, and most probably in the following manner.

The *soil* furnishes magaesian earth, and the clay is rendered blue by muriatic acid. The *shells* supply calcareous matter, and carbonic acid, and they appear to change first to a radiated horney substance, and afterwards to the crystals of selenite, already described.\* The *pyrites* are changed by the actions of air and water, to a saline nature, and give birth to sulphuric acid, hepatic gas, and chalybeate principle. It being well known to chemists, that oxygen united to the sulphur of pyrites, forms an acid, which reacts upon the iron, and the water being decomposed by the iron in this state, hydrogen gas is let loose. Hence volcanic phenomena have fre-

\* The author has several specimens of these substances in different states of change.

quently been imitated, by burying iron filings and sulphur, moistened with water, in the earth. The *sea salt* supplies muriatic acid, and the soda of that salt united to the sulphuric acid of pyrites, forms the Glauber salt of these waters.

6. That a sufficient supply of aperient saline water may be had at Cheltenham for any possible consumption, since nearly the whole soil south of the Chelt, contains more or less of these saline substances. And little more remains to be done, than to select the fittest situations to establish new wells.

## CHAP. IV.

### DESCRIPTION OF THE MINERAL WELLS AT CHELTENHAM, WITH THE CHEMI- CAL AND MEDICAL PROPERTIES OF THEIR WATERS.

On both sides of Cheltenham there are elevated lands, which consist of immense beds of calcareous blue clay, forming an intermediate valley, on which the sandy soil of the town is situated; and the river Chelt, of inconsiderable magnitude, runs nearly east and west, parallel with, and close to the south side of the town, in the most dependant part of the concavity.

On the south side of this small river within a distance of 800 yards, all the aperient saline wells are situated, and in the low alluvial lands adjoining the same river, the simple chalybeate wells take origin. *Vide plate 1.*

The number of mineral wells at Cheltenham have so greatly increased, that the author can



reckon, not less than sixteen; he has therefore directed his principal attention to those of most notoriety. In like manner the varieties of waters are so numerous, and so changeable in many of their properties, that chemists are discouraged from attempting a complete analysis of them; but the author has stated the result of chemical experiments hitherto made, and the most general circumstances which serve to distinguish the different waters.

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## SECT. I.

### THE APERIENT SALINE WELLS.

These are delightfully situated in a soil of calcareous blue clay, under a stratum of brown clay, and the surface has a gradual ascent from the river Chelt to an elevation of less than sixty feet. The higher the land, the deeper in general the well, the different springs being found nearly at the same level; but the wells are frequently dug greatly below the springs. This elevation is intersected in a direct line, north-east, and south-west, from the Chelt to its summit,

by Badgeworth road, which divides most of the new from the old wells.

Their waters do not differ materially from each other in the quantity of *saline ingredients*. The Glauber salt prevails in some, and the sea salt in others; but the operation on the bowels is nearly the same with all. The chief difference consists in the proportion of iron, or sulphurous impregnations they contain.

Almost all the aperient waters possess more or less iron, and some contain it in large proportion; but it generally exists in such a state of combination with them, as to require the addition of oxidating substances to assist the usual tests in detecting it.

Sulphuretted hydrogen gas is also contained in most of these waters, notwithstanding they hold iron in solution.\* But the sulphurous principle

\* It is a remarkable fact, that although sulphuretted hydrogen gas is the best test of metallic solutions, by abstracting their oxygen, and decomposing them, yet these exist chemically united in most of the Cheltenham waters. Thomson in his system of chemistry, vol. III. p. 373, and 375, observes, that water impregnated with this gas, forms a hydro-sulphuret, which may continue a considerable time with iron in solution; and this kind of junction has been explained by Kirwin in the following manner: antagonist salts may co-exist in solution, when they are in small quantities with a large proportion of

The taste is slightly saline, and a small impression of bitter, like that of Epsom salt, is left upon the palate, but it is by no means so nauseous, as most of the waters of the other wells.

The saline contents in a wine gallon are :

	Grains
Sulphate of soda and magnesia,	
( <i>Glauber and Epsom salt</i> )	- 480
Oxyd of iron	- - - - 5
Muriate of soda, ( <i>sea-salt</i> )	- 5
Sulphate of lime	- - - - 40
Carbonate and muriate of magnesia	25
	<hr/> 555 gr.
Carbonic acid	- - - 30.36
Azotic and hepatic gases	- 15.18
Cubic inches	<hr/> 45.55

This analysis, which was made by Dr. Fothergill in the year 1788, appears to be nearly the state of the water in the present day\*, with this exception, that the author, in some recent experiments, could not obtain so much residue by

\* An experimental enquiry concerning Cheltenham water, Second Edition, by A. Fothergill, 1788.

thirty-six grains in a gallon, as appears in the printed analysis.†

The water of this well has not discovered any appearance of hepatic gas for several years past, although it generally had a strong flavour of it, less than twenty years ago.

The author has frequently seen it turn purple in the morning, by the addition of a few drops of tincture of galls, and fail to exhibit the same appearances in the middle of the day, or when the water had been exposed a few minutes to the atmosphere, by the escape of the carbonic acid, which rendered the iron soluble. A fact that evinces the propriety of drinking it as early as possible in the morning.

Its medical virtues depend entirely upon the three first articles of the analysis, aided by the

† The village of Lemington, two miles from Warwick, and forty from Cheltenham, has lately come into considerable reputation as a bathing place, on account of containing springs of a strong saline water, which supply numerous cold and hot baths. The water has been compared to those of Cheltenham, but the resemblance is not great. The author found it much stronger of saline matter, than any water at Cheltenham, and not unlike sea-water in saltness. The contents are almost all sea salt, with very little Glauber or Epsom salts combined.

diluting principle of water. The iron strengthens the stomach, while the neutral salts operate on the alimentary canal in an expeditious manner, and generally without producing gripes. And it appears that the water retains its laxative properties nearly as much as it did sixty years ago, by the statement of old authors, since a dose of less than two pints, proves aperient to the constitutions of the greatest number of people who drink it.

#### II. THE ORCHARD WELL.

It has obtained the name from its situation at the top of a field of fruit trees. The well, covered over with a square pump-room of brick, was dug in the year 1807, twenty-four feet deep in blue clay, to supply the deficiency of water at the old well, from which it is not more than a hundred yards distant.

Although the rise of the water in the well was found to be ten feet, yet it was drank so low in the summer of 1808, and in June 1809, as to become muddy; and its transparency is sometimes affected by heavy rains, but at present it supplies near two hundred drinkers, with a transparent water, which sparkles a little on pouring from one glass to another.

The impression it makes upon the palate, is not unlike the one produced by the water of the old well, a slightly bitter and saline taste; and for two years after the establishment of the spa, the water possessed a strong odour of hepatic gas, which by constant pumping, from the great request it is held in, is now seldom discovered in it.

By the author's last experiments, in May 1809, the temperature at eight o'clock in the morning was  $52^{\circ}$ , when the atmosphere of the room was  $60^{\circ}$ , which is a degree and a half colder than the water of the old well. The specific gravity was, 1.0054; and it accordingly raised the boiling point to 214.5, which is two degrees higher than occurred from the same experiment made on rain water.

It contains a portion of iron, and therefore prussiate of potash, with the assistance of a few drops of nitrous acid, turned it to a transparent deep green colour, when no such result was produced by the same tests, on distilled water. But tincture of galls which changed it to a muddy dark green, had the colour immediately discharged by adding nitrous acid.

Soon after its discovery, nineteen inches of aerial fluids were obtained from a gallon of water, twelve of which were carbonic acid; but

not a single bubble of hydrogen gas could be collected in the recipient, although the water had at that time a strong odour of it, and must have been decomposed in the process.

The residue from a gallon of water, after complete desiccation, was 499 grains, and by allowing 30 for waste, we may fairly estimate the solid contents at 529 grains; which is more than has lately been procured from the water of the old well, and equal to an ounce and three quarters of crystalized salts.

The saline matter of this water being more abundant, and the proportion of sea-salt considerable, its operation on the alimentary canal is extremely salutary, and its action often brisker, than with the water of the old well, but it contains a smaller proportion of iron. It is a valuable remedy in most bilious cases.

### III. THE KING'S WELL.

It derived the name from the visit of our august sovereign to Cheltenham, in the year 1788. On leaving the place, his Majesty ordered a well to be sunk, for the domestic uses of Lord Fauconberg's house, wherein he had resided during the time he drank at the old well; but in-

stead of a fresh spring, a saline one issued from the blue clay, at the depth of fifty-two feet, which contained a greater proportion of salts than the water of the old well.

It is situated about 500 yards above the old spa, and a hundred from Bayshill Lodge. The water was so abundant for a great many years that the inhabitants of the town, and servants of the company, drank it copiously, besides pailfuls were given to horses every morning, and salts made from it in winter. But the supply of water gradually failing, the well was entirely shut up two years ago. The author therefore considers it totally unnecessary to republish the analysis he made of the water in the year 1803.

ESSEX WELL, now constructing in a field, formerly the property of Lord Essex, is situated about 320 yards, directly above the old spa, and opposite to Montpelier wells, on the west side of Badgeworth road.\* The saline spring issued at the depth of 40 feet from the side of the well next Bays hill, but the well was dug 60 feet deep, and covered over with a small square building

\* This together with all the wells before described, are the property of the Rev. Nash Skillicorne; and Mrs. Forty has been 36 years in the office of pumper.



of brick. The water has a slightly saline and bitter taste, without any flavour of hepatic gas.

#### IV. LORD SPURBORNE'S WELL.

It is situated in the waste lands, at the summit of Badgeworth road, about 600 yards above the old spa. The well, 40 feet deep, is covered over with a small square building of brick, and the pump is placed in a similar building of stone conjoined to it.

The author discovered this water with the boring machine, and opened the well for public use in August 1804. For two years afterwards, it produced such an abundance of excellent saline water, that more than a hundred gallons were consumed, most fine mornings of the summer season. But the pump having been removed some yards from the well, and the water undergone such a complete change, since he gave it up, it has at present few drinkers. He, however, considers it necessary to describe the state of the water in 1806, as it may some time or other, recover its former properties.

It was always beautifully transparent, and sparkled in the glasses. The temperature was from 51° in common, to 53° in the hottest season, and generally two degrees colder than any of the

other mineral springs, which is a desirable property in the hot season. The taste resembled diluted sea water, with a strong flavour of hepatic gas, and this sulphurous principle could always be detected, by invisible words written with a solution of mercury in nitrous acid, becoming legible when dipped in the water.

The saline matter obtained from a gallon of water, after complete desiccation, weighed 540 grains. And when 80 gallons were evaporated until the selenite dropped, and was thrown away; the water afterwards yielded two pounds of crystals by slow evaporation, which were an inch in length, and half an inch in thickness.

Nearly half the contents of this water consisted of sea-salt, and it contained a small portion of iron. The effects on the stomach and bowels, were therefore similar to those produced by the rest of the saline springs; and like other sulphurous waters, it also possessed a specific power over diseases of the skin.

#### V. MONTPELIER WELLS.

They are so called, from their situation in an elevated healthy field of that name, on the east side of Badgeworth road, and not 800 yards from

the center of the town. They were opened in May, 1808, and the waters soon acquired considerable reputation, which encouraged the proprietor to make the following arrangements, just now finished.\*

The long pump-room, with pillars in front, and a music room at the top, situated in the upper corner of Montpelier grounds, contains three pumps, which raise waters from two wells. These are discharged by brass cocks, on each side of the pump case, which are numbered. There are besides three smaller cocks, which discharge water conveyed from a third well, at a considerable distance.

**NO. 1. THE CHALYBEATED SALINE WATER** is brought from a well under a small brick building, about 20 yards distant, and discharged by the outer cock.

This well is 45 feet deep, in blue clay, and the pump draws from within 4 feet of its bottom. At the time the water was analysed, it collected 800 gallons in 24 hours. The temperature of the water was 53°, when that of the room was 60°; and in consequence of this abundance,

\* All the wells on this side of the road, are the property of Henry Thompson, Esq.

together with the distance of the spring from surface water, it is almost always beautifully transparent, and sparkles when poured from one vessel to another.

It tastes a little saline and chalybeate, leaving a slight impression of sea-salt in the mouth, but at present retains no flavour of hepatic gas. It is stated in the analysis as containing no sulphurous principle; but it is a remarkable fact, that before the well was cleaned out, a few months ago, the water was extremely fœtid, and had a stronger odour of hepatic gas than any of the other mineral wells; but these have completely quitted it, by being cleaned, and by constant pumping, from its being more drank than any other water on the same side of the road.

The saline contents in a gallon are:\*

	Grains.
Muriate of soda ( <i>sea salt</i> )	219.75
Sulphate of magnesia ( <i>Epsom salt</i> )	98.25
Sulphate of Soda, ( <i>Glauber salts</i> )	80.01
Carbonate of iron	7.15
Muriate of magnesia	40.00
Muriate of lime	36.00
Sulphate of lime	85.01
<b>Solid contents</b>	<b>566.17</b>

\* Analysis of mineral waters, at Cheltenham, by Fredrick Accum, 1808.

Carbonic acid, gas, &c.	16.10
Atmospheric air	1.21

Gaseous fluids 17.31

The water of this well acts on the bowels, in producing evacuations, like the water of the other spas, and is stated in the analysis, to contain an uncommon large proportion of iron. Although the author has often experienced its good effects upon the constitution as a tonic, he does not consider it as containing so much iron as Tunbridge water, and did not find it change with the tests of iron so readily as the water of the original old well.

No. 2. THE STRONG SULPHURETTED SALINE WATER, is pumped from within three inches of the bottom of the well immediately under the room, and discharged by the inner brass cock. The well, 46 feet deep in blue clay, collects two thousand gallons of water in twenty-four hours. The water immediately from the pump, is beautifully transparent, and does not lose it by standing; has a strong saline taste, and an extremely fetid odour by emitting hepatic gas, which is lost by a few minutes exposure to the atmosphere. When the temperature of the room was 60°,

that of the water was 1.02; and the specific gravity compared with that of distilled water 279 to 277, the difference being on a volume of

of the water of the same weight of the water.

A wine gallon contained these ingredients;\*

	Grains.
Muriate of soda (sea salt)	183.25
Sulphate of soda (Glauber salt)	53.
Sulphate of magnesia (Epsom salt)	48.12
Hydro sulphuret of lime (sulphurous principle)	32.75
Muriate of magnesia	29.
Sulphate of lime	66.5
Muriate of lime	24.12
Carbonate of lime	18.
Carbonate of magnesia	5.75
Solid contents	460.5
	Cubic inches.
Carbonic acid gas	7.9
Sulphuretted hydrogen gas	11.
Gaseous fluids	18.9

Near half the solid contents consists of sea salt, which is united to a little Glauber and Epsom

\* Analysis of Cheltenham waters by Mr. Accum, A. 1808.

som-salts, that occasion it to operate upon the bowels like the aperient waters of the old wells. It contains no iron, but abounds with a sulphurous principle, found by experience to stimulate the exhalent vessels of the skin, and to cure cutaneous diseases in a powerful manner. It is likewise useful in many bilious cases.\*

No. 3. THE WEAK SULPHURETTED SALINE WATER, is pumped from within 3 feet 6 inches of the bottom of the same well under the room, which supplied the former water, and is delivered by the middle brass cock.

It generally has a weaker saline taste, and a slighter odour of hepatic gas, but the temperature is the same, as that of the former water. The difference of these sulphurous waters, from the particular situation of the opening of the suction pipe in the same well, depends upon the different specific gravities of fluids, and their trickling slowly into the well at different places; they must therefore vary a little by rapid con-

\* This water has considerable resemblance to that of Harrogate. The Cheltenham contains much less saline matter altho it is rather more purgative, and does not deposit sulphur on standing exposed to the atmosphere, like the Harrogate.

sumption, and their medical virtues suffer a corresponding change.

**No. 4. THE SIMPLE SALINE WATER** conveyed by a pipe from Bescroft well, distant about 170 yards, on the other side of Badgeworth road, is discharged by a small cock in the circular counter. The well, 42 feet deep, is covered by a tall brick building, thatched over.

The water tastes strongly saline, it is perfectly transparent, of a temperature of  $53^{\circ}$  at  $60^{\circ}$  in the room; and as it possesses no hepatic odour, and but an inconsiderable portion of iron, the pumper calls it *all saline*.

It contains the same kind of neutral salts as the other aperient waters, and for the most part a greater abundance of them. It is therefore conveyed by pipes to the engine house, for the purpose of making salts.

**WATERS IN THE OCTAGON TURRET.** In the lower corner of Montpelier field, the small octagon building, adjoining the Gothic cottage, contains three pumps—*A chalybeated saline*, pumped from a well 40 feet deep, immediately under the building. *A strong chalybeated saline*, brought by a pipe from a well under the Gothic cottage,



55 feet deep. *A weak saline water*, conveyed by a pipe from a well 40 feet deep, and 6 yards beyond the Gothic cottage. This last has so little chemical impregnations, that it has been denominated the milk well.

**WATERS IN HYGEIA HOUSE.** This spacious stone building, environed by a viranda and stone pillars, and situated at a little distance from the baths, contains three pumps. But as these waters are neglected by the public, the author thinks, it only necessary to state the names that have been given them, which will sufficiently explain their nature, by comparing them with the observations of this treatise. *A carbonated steel water* rises out of a black ferruginous mould, a few yards from the house. *A chalybeated weak saline*, rises out of blue clay in the area of the house. *A weak sulphuretted saline* arises out of blue clay immediately under the house.

The waters of Bescroft meadow, Octagon Turret and Hygeia House, are chiefly used for making salts; for altho the different saline wells supply great abundance for drinking, and bottling, they do not produce sufficient quantity for making salts upon a large scale, and new wells

are digging at the bottom of Bays hill, for that purpose,\*

## SECT. II.

### THE SIMPLE CHALYBEATE WELLS.

These are often, with great propriety, called steel wells, from their similarity of principles to steel, which is also a carburet of iron, and to distinguish them from the aperient saline waters, which are likewise called chalybeates,

\* The steam boiler, which consumes daily about four hundred gallons of water, is fed for fourteen days together. The fluid is then drawn off, and cleared from selenite by elutriation. This purified liquor yields by further evaporation in a small copper, and cooling, at the rate of ten pounds a day, of crystals of Glauber and Epsom Salts, mixed together; and the greatest part of the Sea-salt sinking from the surface of the hot fluid, remains in the residuum. The chalybeated saline waters yield most Glauber and Epsom Salts, and the sulphureous ones, the greatest quantity of Sea-salt, by this process.

by containing iron, in combination with their purgative salts.†

Iron is a metal so universal in nature, that it exists generally in the animal and vegetable kingdoms, and in most coloured earths, stones, and sands. It is found in large quantities, uniformly blended with clayey and boggy soils, as well as abounding in strata and veins of craggy mountains. It is likewise combined with sulphur, in detached pieces of pyrites in many clay lands, which we have described to be the case with the saline soil of Cheltenham; at the same time carbonic acid, the solvent of iron, abounding every where in the bowels of the earth, simple chalybeate waters are the most common of all kinds of mineral springs.

But the carbonic acid escaping from these waters, by its elasticity, they lose their irony impregnations, and often become fit for domestic uses. All the house-pumps at Tunbridge Wells are chalybeate, but are reduced by boiling to the state of simple water. When pump-

† The word saline is often used in this treatise to distinguish the purging waters only, although properly speaking, all chalybeates are saline, since iron is insoluble until it is converted into salt.

ed on green tea in their cold state, they are changed to a dark or purple colour, but poured on it boiling hot, no such change takes place. In like manner they lose their properties, by exposure to the atmosphere, and by transportation from one place to another, by the escape of this volatile principle.

#### VI. THE ORIGINAL CHALYBEATE SPA.

This carbonated steel well is situated in a level meadow on the banks of the little river Chelt, about two hundred yards from Cheltenham mill, and the same distance from the top of the town. It is only four feet deep, and the proprietor was obliged to raise a mount of earth, and a plantation of trees, to shelter it from solar heat.\*

There existed for many years, an open hole at the side of a running stream, which contained an iron water, that the country people resorted to for disorders of the eyes, and the late Mr. Cruikshanks, traced the water by its ochry channels through a thicket of brush wood a hundred yards nearer its source, and established this well

\* The proprietor, Mr. Barret, has rendered the access to this delightful spot extremely commodious.

in the year 1803, to which a pump-room was immediately built, within fourteen yards of it.

The water issues out of a black gravelly soil, under a yellow clay, and the supply is near a hundred gallons an hour. It is transparent, resembles common water, with the smell and taste of iron, and like other simple chalybeates, produces a brown stain, and a greazy appearance on the tumblers, and becomes turbid by standing exposed to the air.

The temperature of the water from the pump, varied from  $47^{\circ}$  in November, to  $60^{\circ}$  in August, in consequence of its superficial situation; and the specific gravity in the former month was 10020.

The author's experiments upon the water in August 1803, will serve to illustrate the composition of all the simple chalybeated waters\* at

\* 1. By exposing the water twelve hours to the atmosphere in an uncorked bottle, it changed nearly to the state of common pump water.

2. When placed over the fire, it emitted air bubbles, and after boiling 12 minutes, deposited a brown powder, which plainly indicated the escape of a carbonic acid gas, and the precipitation of iron.

Cheltenham, which differ little from each other,

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3. Lime water rendered it milky, and sulphuric acid produced air bubbles, with an increase of transparency, denoting the carbonic acid to be considerable.

4. Tincture of galls turned it purple; green tea and brandy turned it to a dark colour. But these appearances did not take place after the water was boiled, in consequence of the loss of free carbonic acid.

5. The solution of nitrate of silver produced a small white flaky precipitate, which became bluish by exposure to the light; and the acetate of lead produced a copious white precipitate, soluble in acetic acid. These indicated the presence of muriatic acid.

6. The acetate of barytes produced light turbidness, denoting some sulphuric acid.

7. Oxalate of ammonia produced copious white precipitate, indicating the presence of lime.

8. Pure potash and pure ammonia, produced a white precipitate of magnesia.

The proportion of these substances was next determined.

9. By evaporating, near the boiling point, 11 gallons of water to dryness, 220 grains of solid matter were obtained.

10. This powder digested with 2 ounces of alcohol, was filtered and dried at 212°. The alcohol having taken up muriate of lime, the dried mass weighed only 102 grains.

11. The residue being digested 24 hours with six ounces of cold distilled water, was filtered and dried. The water having taken up the muriate of soda, the dried residue weighed 106 grains.

12. After boiling the residue a quarter of an hour in 11

except in temperature and steadiness of character.

pints of distilled water, it was filtered and dried. Having lost its selenite, it weighed 158 grains.

13. The undissolved residue was oxydated, by exposure for three weeks to the rays of the sun in a moist state. It did not cease to effervesce until it was saturated with 12 ounces of distilled vinegar, which took up all the magnesia and lime. When filtered and dried, there remained 20 grains of oxid of iron. This oxid dissolved in muriatic acid, and precipitated by prussiate of potash, yielded only 15 grains.

14. The spiritous solution which had passed the filter was evaporated to dryness, and moistened with 12 drops of sulphuric acid. This paste exposed to moderate heat, emitted white fumes of muriatic acid; and urged with strong heat, yielded a little lime.

15. The watery solution, which had passed the filter, evaporated in 85 degrees of heat, exhibited slender crystals on the surface of the hot fluid, adhering to the sides of the basin, which being dried on bibulous paper proved to be common salt.

16. The boiled solution evaporated to dryness yielded 8 grains of earthy salts, which proved by the tests of barytes, pure potash and ammonia, to be sulphate of lime.

The *aerial principles* collected over mercury from a pint of water taken immediately from the spring were three cubic inches of air absorbed by lime water. Two and a half suffered diminution by nitrous air. One underwent no alteration from nitrous gas, and extinguished a lighted taper.

The wine gallon contains,

	Grains.
Carbonate of iron - - -	1.36
Muriate of lime - - -	2.55
Muriate of soda - - -	2.02
Sulphate of lime - - -	73
Carbonate of magnesia and lime	12.55

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Solid contents 19.21

	Cubic inches.
Carbonic acid gas - - -	24
Atmospheric air - - -	20
Azotic gas - - -	8

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Gazeous fluids 52

This water resembles that of Tunbridge in chemical composition, but the latter is certainly the strongest of iron, and by rising with great force from considerable profundity, into the stone bason, has the most steady character.\*

\* Tunbridge water, considered the strongest of iron in Britain, is represented by Dr. Babington's analysis, as containing only one grain of iron in a gallon; whereas, Cheltenham chalybeate, which is not so strong, yielded by this analysis near a grain and a half. Seven grains were obtained by Mr. Accum from a gallon of the chalybeate saline at Montpelier wells; whereas Bergman got only five grains from Pymont water,



**CAMBRAY CHALYBEATES.** Since the establishment of the former well, two other carbonated chalybeate wells have been opened, near the northern bank of the little river Chelt. About two hundred yards from the high street, there is an uncovered pump in a handsome garden, that supplies abundance of carbonated steel water, which is frequently colder than that of the original spa, from the well being 16 feet deep.\*

Another situated within fifty yards of the last, is covered with an octagon lettuce viranda, which also yields abundance of a similar carbonated steel water.† All these kinds of waters at Cheltenham contain the same impregnations; but vary at different times, owing to their particular situation, as they are sometimes liable to be diluted with rain water.

**IRON** is the safest and most friendly to the human species of all the metals, as a remedy in diseases, mercury not excepted. All preparations of iron corrugate the living fibre, as we

the strongest chalybeate in Europe. Which results are indicative of the uncertainty of chemical experiment upon minute portions of iron, passing numerous filters.

\* The property of Colonel Riddle.

† The property of Mr. Baynham Jones.

perceive by their stypticity in the mouth. In consequence of which, they have a tendency to produce costiveness, and are employed to restrain preternatural evacuations, by constringing the extreme vessels of the system.

It braces the stomach, and improves digestion, so as to increase the elasticity of the muscular fibre, and excite the nervous energy, by augmenting nutrition. And by encreasing the red particles, may be said to generate blood in a double ratio. But Cheltenham waters diffuse the stimulus of iron more generally over the system than the metal taken in substance. And both the carbonic acid and the cold water, assist in stimulating the various emuntories of the body. Hence the general glow of heat, encrease of urine, and sometimes of perspiration, which often succeed a dose of these chalybeates.

All carbonated chalybeate waters are more invigorating in proportion to the iron they contain, than is observable from any artificial preparation of the metal. An eighth part of a grain of iron, contained in a dose of steel water, having more salutary effects on the constitution, than two or three grains of the oxid of iron in powder. The reason is, the acid of the sto-

mach dissolves but a small part of ferruginous powder, and the remaining portion passes downwards without entering the circulation, and thereby gives the alvine evacuations, a dark colour. Whereas repeated doses of chalybeate waters do not depend upon the fluids of the stomach for solution, and seldom produce the same effects upon the contents of the alimentary canal.\* Hence the oxid of iron, during its solution in the stomach, is often accompanied with fetid eructations, and by remaining in an undissolved state, is apt to produce nausea, sense of weight, pain of the stomach, and sometimes purgings, which seldom arise from a moderate dose of the springs.

\* Neither Tunbridge nor Cheltenham waters, discolour the intestinal evacuations, according to the author's enquiries on the subject.

## CHAP. V.

### THE MODES OF ADMINISTERING THE DIFFERENT KINDS OF WATERS.

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#### SECT. I.

##### ADMINISTRATION OF THE PURGING SALINE WATERS.

**THESE** are so little variable in their nature, and the modes of using them are so well ascertained by long established practice, that few observations will suffice on the best methods of applying them to diseases.

The following directions are most deserving notice, and will apply equally to both the old and new purging wells of Cheltenham.

The best **SEASON OF THE YEAR** for a course of these waters, is the summer, on account of the advantages derived from the co-operation of air and exercise with the water, as explained in the introduction to this treatise. It is also the

season which renders the removal of bile, and undigested food from the bowels, most necessary for health.

The waters are likewise strongest, and their refreshing effects most felt, in summer ; for most superficial mineral springs are weaker in cloudy and rainy seasons, than in clear dry weather. But it may also be drank in the middle of winter with considerable advantage, by taking off the chill, or drinking it at the fire-side.

The spring and autumn are likewise proper seasons for its use, on account of the tendency of the constitution to inflammatory and eruptive diseases at these periods. Hence the usual time of the resort of company to Cheltenham begins in April. The season is at its height from the beginning of July until the end of September, and finishes in October, except with those persons who intend to remain all winter ; of which there have been considerable numbers during the last years.

Travelling in hot weather ought to be gentle and easy, for vascular commotion once excited, may terminate in a feverish habit of body, that will defeat the intended purposes of the water. And for the same reason, it may sometimes be necessary on the first arrival at Cheltenham, to

rest a day or two, before commencing the purging plan.

PREPARATION of the body has been usually recommended, previous to drinking at mineral springs, but with Cheltenham water this is not necessary at all times, because it is often of itself extremely active, and in the way commonly expected from preparation.

There are, however, a great many cases where the water will distress the stomach and head, and will agree much better with the patient, after the bowels have been excited to action by the aid of preparatory medicine.

Invalids in the habit of using calomel, may begin with taking two or three grains of it, in the form of a pill at bed-time, and work it off next morning with a dose of water at the well. Three doses of calomel, with an interval of several days between each, to act as purgatives, and afterwards to be remitted for a time, will, with the use of Cheltenham water, be as much as can be taken in any bilious case, without incurring the risk of its absorption, which ought never to be done without the advice of a medical practitioner on the spot.

The best **TIME OF THE DAY** for drinking the water is found by experience to be early in the morning ; and it is seldom used at any other, at Cheltenham. Medicines intended to operate in the circulation of the blood, ought to be taken with a full meal ; but water, which acts on the alimentary organs only, should be drank on an empty stomach : and the use of it at this time is attended with a further advantage, of the operation being finished before dinner.

The author has known some invalids drink the water at bed-time, for the purpose of remaining all night in the bowels, to work itself off early next morning, by the assistance of exercise. But the principal benefit is derived from drinking it at the pump early in the morning, when the temperature, volatile principles, and iron, enhance the value of the remedy ; and the early walk, in the pure cool air, enables those who pursue the salutary practice, to eat a hearty breakfast. The waters generally contain most steel early in the morning, and many of them entirely lose it, in the middle of the day.

The **DOSE** of the water ought always to be moderate on first using, and the quantity increased according to the effects produced on the

body. The dose will, therefore, very much depend upon the age, sex, constitution, and disease of the patient; and at the commencement of the course, it will require the opinion of the faculty to determine, whether the water should be drank in such quantities as to gently increase the natural evacuations of the body, or to act as a brisk cathartic.

In the writings of the ancients, and even in modern times, upon the continent of Europe, five or six quarts of mineral waters are considered as a moderate dose.\* But in the improved state of medical science in this country, physicians are adverse to such large quantities. An over or under dose are equally improper; the one injures the stomach by distention, and the other is attended with loss of time, perhaps during an increasing disease.

These waters are generally intended to produce more or less purging; and it very seldom happens that benefit is obtained from them, by those patients who apply at Cheltenham, without they be taken in sufficient quantity to ope-

\* Dr. Rutton, who wrote largely on mineral waters, in 1757, says, in the chapter on the waters of Spa, "Those who drink little are not benefited; the greater the quantity any one drinks the better, if the waters pass off well: so that some have drank twenty-one pints in a day." *Synopsis*, p. 333.



rate upon the bowels ; the dose must, therefore, be regulated by the number of evacuations. They also prove diuretic, which is a property common to all neutral salts largely diluted, and not peculiar to Cheltenham waters alone, although it is not their least effectual operation in the cure of diseases.

A small half-pint tumbler, containing about six ounces of water, and a like quantity repeated, after walking a quarter of an hour or twenty minutes, will, in general, be sufficient to begin with. In two or three days the quantity may be increased to two glasses, containing twelve ounces each, called well-pints. Some cases may require three of these largest tumblers, to be drank with the use of exercise between each. It is necessary the water should be taken in divided portions, to prevent nausea, or distention of the stomach, and accompanied with exercise, to quicken the operation of the water. It is better to drink a quart of fluid, of any kind, at three times, than at twice, particularly of Cheltenham water, which might distend the stomach. Three or four tumblers full, drank with a quarter of an hour or ten minutes between each, will be sufficient in any case whatever ; although the author has seen people imprudently take larger quantities, but it is always better to assist the

water with purgative medicines, than to drink four pint tumblers in one morning.

Now and then casual symptoms occur, on first drinking the water. If it disturbs the stomach, instead of passing off freely, Cheltenham salts must be added to one of the glasses. These salts are kept in a state of solution at all the wells, for the purpose of strengthening the water, when it is not sufficiently active of itself. Salts are prepared at the original Spa in winter, for this purpose, as well as for sale; and at Montpellier wells, *concentrated water* is likewise provided for the purpose of strengthening it. By means of the boiler, which heats the baths, two thousand gallons of Cheltenham water were evaporated to eighty, or to a twenty-fifth part, and filled into 500 bottles, rather larger than pints: each of which contained four ounces of concentrated saline matter, equal to half a pound of crystallized salts, so that one tablespoonful, or half an ounce of the liquid contained a quarter of an ounce of salts; which more than doubles the strength of a pint of water.

But it very often happens that the water cannot be made to operate, even by these auxiliary means, and the utmost skill of the physician is required to render the waters safe and efficient,

in cases of torpid bowels, and in the numerous instances of obstinate constipations from organic diseases, which are sent to Cheltenham, after having foiled the efforts of medical men in various parts of the country. But, in most of these cases, Cheltenham waters, by proper management, can be made to pass the intestinal canal, and sometimes more readily than purgatives of a more acrid nature.

The symptoms of flatulence, nausea, and vomiting, will often receive some degree of mitigation from pepper-mint drops, æther, or a tea-spoonful of simple tincture of cardamoms, taken with the water, or after it. When it continues to disturb the head with giddiness or pain, the water should be warmed, or exposed to the atmosphere a few minutes before it is drank, to dissipate the aerial principles ; and after drinking it, the patient should walk about in the open air. When it produces gripes, or habitual purging, vegetable food, malt liquors, and acid fruits should be avoided. These, indeed, should always be used sparingly, at the time Cheltenham water is operating upon the bowels. Large doses of these waters, like those of most other mineral springs, will sometimes swell the ankles, which is often encreased by unusual exercise before

breakfast in hot weather, to an alarming degree; but in most cases, the author has been able, by certain restrictions, to enable the patient to persevere in the course of waters, without incurring danger.

The TEMPERATURE of the water is of more importance than generally imagined. In its cold state, it braces the stomach, and refrigerates the body. In its warm state, it relaxes the stomach; and, by the loss of its volatile principles, proves less flatulent. Invalids should, therefore, endeavour to bring themselves gradually to the use of it in the coldest state, unless in cases of gout, rheumatism, spasms, gall-stones, or indurated viscera; and then some of the water, which is kept on purpose by the pumper, heated, should be added to each dose.

The DURATION of the course should be regulated by the nature of the disease, and effects of the water on the constitution. Those who visit Cheltenham for amusement, are satisfied with drinking as much as relaxes the bowels, for two or three weeks; but invalids, in general, continue at Cheltenham three or four weeks, except in obstinate chronic cases, which require com-

plete alteration of the habit; they are obliged then to persevere in a moderate use of the water for months, and sometimes for years, to get their health re-established. It is a very common practice, after these waters have acted powerfully on the bowels for two or three weeks, to take a short excursion to some neighbouring town, or to drink at the steel wells for a week or two, and return again to the use of the purging waters.

When the saline waters, by improving digestion, increase the fat of the body, their continuance is safe, for any length of time; but when they produce much emaciation, they should be left off for some weeks.

The water should always be left off in a gradual manner, to avoid the mischief that might arise from full diet suddenly succeeding a course of depletion; for this purpose many persons provide themselves with Cheltenham salts, to take two or three times a week, in common water, after they leave the place.

## SECT. II.

### ADMINISTRATION OF THE SIMPLE CHALYBEATE WATERS.

The mode of administering the steel waters requires little illustration, being nearly the same

as with all other simple chalybeates, which are so generally understood.

The course ought to commence with an aloetic purge, or other aperient medicine, such as a dose of the saline spa, to empty the bowels.

Steel waters are apt of themselves on first using to produce purging, especially when the bowels are loaded with bile; but this effect ceases in a few days. These kind of waters are never intended to evacuate; their most usual and salutary operation upon the secretory system is, to promote the flow of urine; and, when accompanied with exercise in hot weather, to excite perspiration: which effects arise chiefly from the bulk of fluid and coldness, and in some measure from the stimulus of their impregnations upon the habit.

The Doses of the water of these wells have such variable effects on different constitutions, as to require time and experience to determine the proportions.

As they are not strong chalybeates, the general dose of water is well adjusted to the powers of the constitution, and the use safer in doubtful cases than a stronger water, but requires a course of longer duration. Invalids generally drink as

copiously as their stomachs and heads will permit, without disturbance. But as a very small quantity will frequently produce giddiness, flushing of the face, and headach; or bring on nausea and distention of the stomach, in some patients; it is proper to begin with one of the smallest glasses, containing about a quarter or a third of a pint. This may be taken about eight or nine o'clock in the morning, accompanied with half an hour's gentle exercise in the air, and repeated again about the middle of the day.

In a few days, if the water has agreed with the patient, three of the same glasses may be taken at equal intervals; for it is better to repeat the number of doses, than to increase the quantity at a time.

It is apt to lose its effect by habit; and therefore in a week or two it may be increased to half a pint at a time. The author has more than once seen a full wine pint taken at a time without any other effect than eructation of wind; and has himself drank three quarters of a pint of the water three times a day, by way of experiment, without any inconvenience. But he considers two wine pints of it drank at three times, to be sufficient for most constitutions, and for every salutary pur-

pose in any disease.---When it is drank at a distance from the well, the bottle must be well stopped, and the cork made to touch the water by screwing it in. The bottle ought not to be heated by the hand, or put into a warm place.

It has been a practice to dilute those chalybeate waters which affect the head by their loose airs, with common pump-water ; and to warm those, of such a cold temperature as to disagree with weak stomachs, by placing a corked bottle, containing the chalybeate, in a vessel of warm water\*. But the water of these wells will not require dilution, nor increase of temperature at any season, otherwise than by warming the glasses at the fire before the water is pumped into them ; and will also be attended with no risk of bursting bottles.

The duration of the course for drinking steel-water generally extends from twenty to sixty days, and longer when the disease proves obstinate.

\* Dr. Ratty, page 317, on Pyrmont waters, says, that putting a bottle of water fresh from the well, and close corked, into hot water, until it becomes milk warm, will not deprive it of its iron, and will fit it for stomachs which cannot bear the water cold.



## CHAP. VI.

**DISEASES WHEREIN THE DIFFERENT  
KINDS OF CHELTENHAM WATERS ARE  
INDICATED, AND THOSE IN WHICH  
THEY ARE PREJUDICIAL.**

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### SECT. I.

**DISEASES IN WHICH PURGING WATERS ARE USED.**

**THE** subject of the purging plan, which naturally embraces a vast number of miscellaneous diseases, is one of the most important parts of the practice of physic, and next to those of the bilious kinds, which are to be considered separately. Stomach complaints, and cuticular affections of an anomalous nature, are benefited by Cheltenham waters, more than any others.

But it is impossible to particularize every disease, without writing a system of medicine; or to print any kind of directions or cautions, that can sufficiently guide the patient in the proper

use of the water, at all times ; for the human body, both in its natural and diseased states, undergoes such constant changes, as to render a remedy that proves beneficial at one time, prejudicial at another. Besides, some diseases, that receive benefit from the waters, are often complicated with others, which do not require them ; and those that require them most, take place in debilitated constitutions, which would otherwise forbid the use of purging waters. It is therefore necessary for invalids, who value their health and lives, to consult a physician in all doubtful and difficult cases. Dr. Saunders says, from observations he made at Cheltenham, " that a third of the whole of those persons who drank the saline waters, was benefited ; one third derived no advantage ; and another third was evidently hurt, by persevering in the purging plan."\* This kind of calculation points out an extensive abuse of a very valuable remedy, which, like other powerful ones, requires careful administration.

Cheltenham water is the only species of purgative that can be taken for a great length of

\* Preface to the 3d edition of Dr. Saunders's Treatise on the Liver.

time, with safety to the constitution, in consequence of the proportion of nutriment being increased, and the system supported under the evacuation, by the water improving the appetite. The author has known a dose of the water, taken every morning for eight weeks together, where the purging did not exceed two or three times a day at most, attended with great advantage to the health; but he is, however, of opinion, that many cases require purging only every other day; and that the water is more generally useful when it acts merely as a laxative.

The following are the principal diseases which require a course of purging waters,

Inflamed and schirrous liver or spleen.

Torpid action of the liver.

Bilious state of the stomach.

Habitual costiveness.

Hypochondriacal complaints.

Sick headach with bilious vomitings.

Some kinds of bilious purgings.

Jaundice and biliary concretions.

Depraved appetite and indigestion.

Pimply eruptions, called scurvies.

Scaly, and scurfy states of the skin.

Inflammations of the skin of the face.

Exudations, and watery humours of the skin.

Some kinds of scrofulous tumours.

Inflammations of the eyes and eyelids.

Inflamed ulcers, and discharges of the legs.

Some stages of rheumatism, and gout.

Inflammatory asthma.

Female diseases.

Piles, and fistula.

Diseases of the kidneys, gravel, and stone.

Intestinal worms.

**DYSPEPSIA** is the most universal of all diseases, and hardly any exist without stomach complaints; we must therefore enter more fully into its history than with other disorders, to distinguish it from common Symptomatic Dyspepsia\*.

Stomach complaints are generally the creatures of our own formation, and seldom exist in the early periods of life. The burning heat of climates—the use of tobacco—tea drinking—over distention of the stomach—indolent habits—excessive mental exertion—and, above all, the abuse of fermented liquors, are the bane of the

\* As this disease is generally symptomatic of so many other diseases, Nosologists have hesitated to admit it as a distinct genus.

human species. They destroy the general system, by weakening the tone of the stomach, and creating an imperfect state of the digestive fluids.

The digestive organs do not permit any kind of alimentary matters to pass into the blood unchanged, except common salt; but this transmutation is very different in the healthy, and diseased states of the body.

In the healthy state, three progressive operations are necessary, to convert dead organic bodies into living matter. First of all, the gastric juice coagulates the liquid ingesta, so as to allow time for the stomach, and the fluids secreted from its coats, to convert the aliment into a sweet, pulpy mass. And all classes of substances are digested into the same kind of bland fluid; which can be separated into three parts like the milk and blood of animals. It is the same in the Bramin of India, who lives on vegetables—the African, who feeds on fish—and the Laplander, who eats nothing but reindeer. This process cannot therefore be altogether a chemical one, but must also depend upon the living power of the coats of the organ itself. In the next place, the bile and pancreatic fluid, are mixed with the liquid mass, to convert it into chyme, and to transmit it through

the alimentary canal. Finally it is united to lymph, and brought into contact with the atmosphere, in the lungs, to complete the process of animalization.

But, in the diseased states of the digestive organs, these operations are considerably varied. The stomach being a muscular bag, which suffers different degrees of plenitude, according to the quantity of its contents, (not by collapse of its sides, but by general contraction), renders it extremely obnoxious to injury: for the living power may be diminished, by the stimulus of over distension, as much as by the deficiency of excitement, from continued contraction. Hence it is, that the quantity of food taken, becomes of as much consequence as its quality, for the health of the human body\*. The stomach weakened, either by inanition, repletion, or by repeated stimulants, has its actions ill performed†. Nausea, sickness, increased flux of saliva, and vomiting, according to the degree of prevailing debility, take place, more especially

\* Dr. Fordyce observes, "that no food is in itself wholesome or unwholesome, but as it is compared with the state of the stomach."—*Treat. on Digestion*.

† Mr. Hunter observed, that, on dissection, he found the stomach uncommonly flabby in many subjects.

in the morning, when the stomach is deprived of stimulus, by its empty state.

At the same time, the gastric fluid becoming deficient, the alimentary substances assume their natural tendency to fermentation. Vegetable bodies change to acetous acid ; which brings on heartburn—vomiting of corrosive fluid—hiccup—pain in the stomach—now and then voracious appetite—and sometimes a short tickling cough. In like manner, animal substances run into the putrid fermentation, attended with offensive breath—eructation of a greazy fluid, which inflames in the fire ; and with putrefaction in the bowels.

Whenever the alimentary fluids are not in sufficient quantity to correct the rapidity of these fermentative processes, numerous other phenomena take place. The air is disengaged from the food, and eructed, at times, in astonishing torrents, even in the empty state of the stomach.

Hence distention of the abdomen—disturbed sleep—sense of suffocation in the throat—difficult respiration—and giddiness of the head, are the common effects of the chemical overcoming the animal powers.

An appropriate quantity of nutritious chyle not being prepared, the body is improperly nou-

rished—the flesh wastes—the strength and spirits are depressed—and a general irritability of body and mind succeed.

Cheltenham waters are of as much use in stomach complaints, as in any disorders whatever; provided the doses be moderate. They lessen the effects of acrimonious matters in the stomach, and gently remove the oppressive load of undigested food from the debilitated organs, without exhausting the system, like more drastic remedies. If dyspepsia arises from full feeding, they will lessen plethora; and if it is attended with feverish habit, they will remove the irritation of bilious and fæculent matters from the intestines, and bring the body to a regular solutive state. Besides, their cold temperature—diluting principle—and irony impregnation, will assist considerably in restoring the digestive powers. Experience furnishes the best possible proof of this; for the first, and most common effect of a course of Cheltenham water is, to improve the appetite.

ERUPTIONS are meant to include all cutaneous disorders, which in popular language have been called scurvies, and not exanthematous diseases, which are altogether of a different na-



ture.\* Exanthemata arise from specific fevers, and destroy the tendency of the skin to repetition; whereas, cutaneous diseases, of a more local nature, render the skin susceptible of frequent relapses, after having been once injured by them.

Most cutaneous diseases are connected with the state of the constitution, and some are hereditary. But a great number are merely diseases of the scarf skin, existing beyond the extremities of the capillary vessels, and thereby little under the power of internal remedies.†

Their connection with the stomach and lungs, is not well understood, but eruptions seldom appear, or disappear, in any great numbers, without producing symptoms of dyspepsia. If they be repelled by cold, and afterwards brought out by heat, or cordials, their second appearance is attended, like the first, with the following

\* The term *Impetigines*, used by the ancients for crusty eruptions, has been adopted by Sauvage and Cullen, as the general nosological term for cutaneous diseases.

† The cuticle, which covers the true skin, being external to the circulation, and consisting of squamous bodies, nearly inorganic, renders cutaneous diseases sometimes immovable for a number of years, and occasions freckles and stains to continue through life.

symptoms: Loss of appetite, sickness and vomiting, pain of the stomach, low spirits, oppression at the præcordia, and difficult respiration: the skin becomes next affected, which proves that the eruptions were the cause of the stomach complaints, and that the constitution exerted its powers to expel them.

The law of the animal economy, which determines the secretion of the skin to alternate with the exhalations of the lungs, (observable in catarrhs arising from suppressed perspiration) is the cause of repelled eruptions, being apt to bring on asthma, and dropsies, particularly in the feeble periods of infancy and old age; and renders caution at all times necessary, to avoid repelling eruptive diseases to the internal surfaces of the body, by external means.

Many of them are so rooted in the habit, that they cannot be cured either by external or internal remedies, but spontaneously disappear, and re-appear, after a number of years, particularly in the spring and autumn, when the constitution exerts its greatest force, to discharge its ailments upon the skin.

The spring is the season of peculiar activity in animal bodies, and disposes the human skin to

alter its state, similar to the tendency in that of animals, to throw off its coverings before summer. A similar predisposition, less strong, prevails in the autumn of the year, the period of general decay.

These tendencies have laid the foundation of the popular opinion, that cutaneous diseases arise from foulness of blood, and that there is a necessity for bleeding, and taking physic, every spring and autumn, for the maintenance of health. The same idea of tainted blood has occasioned the affections of the skin to be called scurries, or scorbutic blotches, &c. But the term is improper, since scurvy is a disease of the whole habit, arising at sea from indolence, putrid food, bad air, and nastiness, which would be greatly aggravated by a purging plan. Whereas the cutaneous diseases, thus denominated scorbutic, are usually local ones, arising from causes of an opposite nature; such as full living, colds, violent action of the cutaneous vessels, &c. which receive benefit from a plan of purging waters. The disease called scorbutic, or scurvy, likewise occurs on land, though rarely, and discovers itself by blotted countenance—spongy gums—debility—low spirits—hæmorrhages—and at

times, pimples—blotches—and ulcers of the skin. But sea and land scurvy is a disease different from a mere cutaneous one, and will be sooner removed, by general remedies, such as bland nutritious diet, cleanliness, air, and exercise; than by Cheltenham water, or any kind of medicines, except bark.

Skin diseases may be distinguished by their external appearances, and for the purpose of this treatise, I shall divide them into—pimples, scales, inflammations, exudations, and some scrofulous affections.

**PIMPLES**, are the most common diseases of the skin. Many of them arise from cold suddenly applied; either externally or internally, to the body; others from great external heat, or from violent exercise, exciting little phlegmons, or rashes upon the skin. They also occur in the face, from hard drinking, and become habitual. And a very violent species called herpes or tetters, is attended with a sharp humour and itching. It attacks in clusters, and seldom can be subdued unless by strong escharotics externally applied.

Decoctions of the woods, called diet drink, have been commonly used against such kinds of eruptions, but they only operate by their quantity as diluents; and Cheltenham water, which

unites the purgative with the diluting principle, will prove of greater efficacy in all kinds of papular diseases, to divert the fluids from the skin, and to relieve the constitution by purging; more especially in those cases brought on by gross and full living.

SCALY ERUPTIONS, and desquamations, are common diseases in cold climates, arising from a dry state of the perspirable surface. The leprous kind, with a rough, chopped skin, is preceded commonly by oppression at the stomach and vomiting, which are followed by crusts in successive crops, with exudations of moisture issuing from beneath them.

The cure of these is extremely difficult, but so far as internal remedies have power over the dry scurfy states of the skin, Cheltenham water is equal in efficacy to any other, particularly to carry off the humours by the bowels. The great dependance, however, ought to be placed upon external remedies, such as warm and tepid bathing. These will soften the skin, and wash the humour from it, while at the same time cooling laxatives may be taken internally. Hence it is, that so many cures are performed on leprous patients at the Bath Hospital, and that the valuable addition of the fumes of sulphur to the cleans-

ing property of hot water, have rendered the baths at Harrowgate so celebrated in scurfy diseases.

INFLAMMATIONS of the Skin, of the erythematous kind, occur frequently upon the nose and face, from a peculiar irritability of the capillary vessels of these parts. An obstinate species called *Gutta Rosacea*, and sometimes a surfeit, occurs in the faces of delicate females, from sudden exposure to cold air, or drinking cold liquids when the body is heated.

In superficial inflammations Cheltenham water will prove as useful, to divert the flux of blood from the skin, as tonic remedies do in removing the debility of its vessels.

EXUDATIONS, or watery humours, occur in various parts of the body; but they are most frequent about the ears. Children are extremely subject to them, during the three first years of their life, and they also occur now and then in adults. I have seen ladies attacked with severe painful inflammations of the ears, accompanied with an acrid serous discharge from behind them, which had a strong tendency to spread over the neck.

All serous humours are dangerous to be repelled. Local remedies are, therefore, never safe,

without at the same time internal means be used to draw off the fluids from the constitution. A serous discharge suddenly checked will be apt to induce partial plethora—convulsions—and dropsy. Blisters, therefore, will prove the safest local remedies, and solutions of neutral salts the best general ones. They, besides, have an advantage over most others, by not confining the patient within doors in fine weather.

SCROFULOUS AFFECTIONS of the skin and glandular obstructions, are commonly accompanied with general debility, and dyspeptic symptoms, and therefore do not require a purging plan; but as some strumous tumours, and ulcers, are attended with chronic inflammation, cases will sometimes occur to require the use of these purging waters.

When old ulcers of the legs are inflamed and painful, or when ulcers discharge much serous humour, Cheltenham waters will prove a beneficial remedy internally.

The author has found that it may be safely employed in some cases of tuberculated lungs, and is extremely useful in many cases of dry cough, in promoting expectoration, by dilution, and keeping the body cool by its saline impregnation.

IN OPHTHALMIES, and strumous affections of the eye-lids, the water may be more usefully employed than in any other diseases of the lymphatic system, by washing the eyes with it, two or three times a day, and taking a dose internally two or three times a week. It will also have good effect in many obstinate chronic inflammations of the eyes, which are not at all scrofulous; but when they are discovered to depend on scrofula, the patient should go to the sea-side. Bathing, fresh air, and occasional use of sea-water internally, are of more importance than all other remedies, in every species of scrofula.

RHEUMATISM and GOUT, may receive benefit from the water in some of their stages. In the beginning of the diseases they will constitute a material part of the antiphlogistic regimen, and improve the state of the stomach at the same time. Three or four doses taken before the time the fits commence, will often carry the fire out of the body, and prevent the explosion taking place; especially when used before repeated attacks of the disease have weakened the constitution, and established a habit of recurrence. Likewise afterwards, when inflammation and pain have subsided, and rigidity and swelling of the joints remain, before the disease has arrived at



its complete attonic state, a dose of the water, now and then, will carry off the inflammatory remains of the disease; but it must at the same time be observed that these waters should be cautiously used in gout, the Author has seen them sometimes bring on a paroxysm.

In **ASTHMA**, of an inflammatory nature, Cheltenham water is sometimes a safer evacuant to remove obstructions of the lungs than bleeding. But in cases of peripneumonia notha, which invade old people in winter, it will be of much greater service than in the spasmodic disease with regular paroxysms.

**FEMALE DISEASES**, which mostly consist of chronic inflammations, receive great benefit from a course of Cheltenham waters. Numerous gentlemen attend at the wells to wash away the effects of the luxuries of the table, but ladies, less liable to stomach complaints, are equally numerous in their attendance, on account of the benefit they experience from the waters. They are of great service in many cases of amenorrhœa, and always in leucorrhœa.

Cheltenham waters are generally useful in diseases arising from sedentary life, or a partial plethoric state of the female constitution.

**HEMORRHOIDS, or PILES**, either external or

internal, arising from a sedentary life, or plethoric habit, will derive benefit from the water, unless in cases where the discharge of blood is extremely profuse. Costiveness, a principal source of irritation, must always be obviated, in cases of piles or fistulous ulcers, but acrid or purging medicines, will aggravate these diseases; therefore cooling laxatives are only admissible.

The suppression of piles, after they have become connected with the constitution by repetition, is often productive of a dangerous translation of the congestion of blood from the hemorrhoidal vessels to the stomach, liver, or head, especially in gouty and bilious habits; in such cases the water taken every other day, for a considerable time, will be of great service.

NEPHRITIC DISEASES, such as gravel and inflammations of the kidneys, are considerably benefited by Cheltenham waters taken in repeated small doses, to act as an alterative more than as a purgative. No other means have been yet discovered of preventing the generation of urinary calculi, or of dissolving them in the bladder, than diluting fluids; hence the Malvern waters have acquired celebrity as solvents of these stones; and Dr. Percival recommended a course of distilled water for the same purpose.

Cheltenham waters will diminish inflammation in the organs, and increase the flow of urine, as is observable in stranguries. In cases of gravel they will wash away sandy concretions from the kidneys and bladder, and even alter the state of the secreted fluid, so as to render it less liable to form depositions in these organs.

WORMS infest the human body, like the Parasites of other animals. Different species inhabit its various parts, but those of greatest magnitude occupy the alimentary canal\*; and by means of their living principle, resist the powerful solvents of that cavity.

The controversy of worms occasioning diseases in a healthy body, or receiving only a nidus from its debilitated state, does not require discussion here†; a certain proportion of those

\* Children are troubled with pediculi; and there is hardly a cavity or viscus of adult bodies, wherein worms have not been found, and of different species according to the nature of the organ.

† The bowels of children in Europe, on account of their humid relaxed state, favour the growth of worms; but they occur more frequently in adults in the West Indies, from a similar relaxation of habit; neither whites nor blacks are exempt from them. The

animals are certainly consistent with a healthy condition of the body, for straggling ones, now and then, make their appearance, where they were not suspected to have existed. But when they are very abundant, symptoms take place in the habit, which represent different diseases; among which a few peculiar ones characterise the disorder in question.

We judge of the presence of worms by itching of the nose---pale or sallow countenance---voracious appetite---fetid breath---starting and grinding the teeth in sleep---uneasiness, and sometimes tumefaction of the abdomen---feverishness, and emaciation of the body---irregular state of the bowels, and sometimes skins or living worms voided.

As Cheltenham water is not equally useful in all worm cases, we must discriminate the principal species of these animals.

TERES, or round worms, are generally about ten inches long, and of the size of a goose quill, resembling common earth worms. They live in

author has seen large round worms crawl from the mouths of men attacked with bilious fever, probably from finding their situation disagreeable at that time; but these animals were not of the nature of earth worms, for they did not live long out of the body.

the stomach, and upper part of the intestinal canal, and very often kill the patient, by perforating the digestive organs. The symptoms are those before enumerated ; and when the disease increases---severe pain of the head and belly---fainting---intermittent pulse---convulsions---and sometimes epilepsy, succeed.

ASCARIDES, or maw worms, are of a white colour, and about three quarters of an inch long. They inhabit the lower part of the intestinal tube. By their diminutive size, and distance from the digestive organs, they produce so little mischief, that some people are subject to them their whole lives, without inconvenience. At other times they produce irritation---heat and tenesmus in the rectum, with mucous dejections.

TRICHURIS, the long thread worm, has a body about two inches and a half in length, with a tail like a hair, three times longer than the body. This species occupies the cœcum, or blind gut.

TENIA, the tape worm, is jointed like the links of a chain, from one to ten yards long. Each joint having a mouth and bowels, they constitute so many distinct animals, with one head and tail in common. It occupies the upper part of the intestinal tube, and drinks up the

chyle so rapidly, as to destroy nutrition. Hence the symptoms of pale countenance---sickness---voracious appetite---costiveness---fetid breath---pain and distention of the belly---feverish habit and emaciation, take place.

The most dangerous species of worm is the tenia, and it is the most difficult to remove, for every joint becomes a new animal. Besides, these worms bury themselves in mucous, and become so firmly attached to the intestine, that nothing but a continued course of purging remedies, which will remove both the animal and the mucous, can perform a cure.

The Author lately observed at St. Chad's Wells at Battle Bridge, near London, many bottles arranged over the pump containing tape worms, which had been destroyed by the water, which is much weaker in its effects on the body than that of Cheltenham, and contains no sulphur or iron, which help to destroy these animals, but resembles it in the saline impregnations.

The late Dr. Heberden, recommended a course of purging waters, that could be repeated without injury to the constitution, as the best remedy for worms.

The Purging waters are CONTRA-INDICATED in cases of debility from old age; infirm old men of cold constitutions require something more nutritious. Likewise, in diseases where the nervous system is weakened, or the vital power exhausted, purgatives are hazardous remedies.

In both these cases they can only be used to remove occasional costiveness, for if the ingesta and secretions be drawn off from the alimentary canal more rapidly than the constitution can repair the waste, nutrition must be diminished, and symptoms of debility, low spirits, emaciation, and perhaps dropsy or palsy, succeed.

There are few chronic diseases in which the body can bear to be deprived of its due proportion of nutriment; and there are none, wherein the bowels ought to be robbed of their natural mucus (except worm cases), which drastic purges, or even mild ones constantly applied, will be apt to do. I consider four or five motions a day, produced by any kind of purging remedy for eight days together; to lessen the lymphatic part of the blood as much as the loss of half a pint of blood from the arm, would do in the same space of time. The impropriety therefore, of using purging saline waters in the following diseases, must be perfectly obvious:

Nervous diseases.

Palsies.

Consumptions.

Hæmorrhages.

Dropsies.\*

Fevers and very acute diseases.

Their utility is AMBIGUOUS in affections of the head. To ascertain the effects of Cheltenham water upon an organ so necessary for existence, involves a question of great importance; more especially as prejudices have prevailed against its use, in cases where the habit is predisposed to diseases of the head.

Most mineral waters have a tendency, soon after drinking, to increase the animal spirits, and produce temporary plethora of the head. Giddiness, headach, and drowsiness, are very common symptoms on the first use of mineral waters, and generally come on immediately after drinking them; but these effects are transient. They for the most part go off again in a few minutes, and gradually diminish in force by an habitual use of the water.

\* Purges, which are often employed in dropsies are of the drastic kind, to stimulate the absorbents of the general habit, and not of that kind which operates only by drawing off the fluids of the intestinal canal.



Whether these symptoms arise from absorption of the water into the circulation, or from its effects upon the stomach, is not a decided point. They however appear to me to depend upon several causes acting primarily upon the stomach.

The simple fluid principle, water, produces a degree of plenitude and tension in the circulating system.\* It will also, at times, raise the pulse, and produce copious flow of perspiration, especially in warm weather, from the stimulus of its bulk and temperature, being communicated by sympathy from the stomach to the general system; but partial plethora of the head cannot be ascribed to this cause.

An over dose of any kind of water not working off freely, may effect the head by distending the stomach. The organ in this state will press upon the large blood vessels and lessen the cavity of the thorax, so as to interrupt the free transmission of blood from the head to the general system, and thus prove dangerous in cases where there is a tendency to sanguineous apoplexy or mania. Hence it is, that sudden deaths, from apoplexy, frequently happen immediately after a full meal, long before the aliment had time to enter the

\* Vide Treatise on Diluents by the author, published 1788.

circulation; and heavy indigestible suppers produce night-mare. There is therefore reason to believe, that when the stomach continues over distended with water for a length of time, it may prove prejudicial to the head.

But the most common cause of cephalic symptoms arises from the quantity of loose airs contained in mineral waters. The intoxicating effects of carbonic acid gas both in beer and water, rendered volatile by the heat of the stomach, are familiar to every person's observation. Malvern and Bristol water, which contain more gaseous than solid matters, produce vertigo, and slight headach; and chalybeates, which contain the greatest proportion of carbonic acid gas, can only be taken in comparatively small doses, on account of their liability, on first drinking, to produce giddiness, headach, and sense of fulness in the head.\*

But Cheltenham water, which contains a

\* Dr. Rutty observes, that the celebrated Pouhon and Geronsterre waters in Germany, which have given origin to the name of spa to many other chalybeates, contain iron, with such abundance of carbonic acid and sulphureous vapours, that they do more harm than good in disorders of the head.

*Rutty's Synopsis, Qto. page 31.*

smaller portion of elastic fluids than most other kinds of mineral waters, produces now and then vertigo and slight headach, especially when a large quantity of the water is taken, and does not work off; or when its neutral salts excite nausea. Giddiness is generally a precursor of vomiting, whether it arises from food, medicine, or any other cause disturbing the stomach. But an operation of this nature upon the head, by nauseating the stomach, can never be injurious to the brain or its diseases. On the contrary, Cheltenham water, when it purges, has a tendency to cool the brain, and to lessen plethora in the head. The effects of the small portion of iron it contains are completely superseded by its cathartic virtues. It does not accelerate the pulse; and whenever apoplexy or mania have succeeded its use, they must have arisen from the congestion of the liver, which directed to the use of the water, or from too free a use of it, debilitating the constitution.

## SECT. II.

## SIMPLE CHALYBEATE WATERS.

Steel waters are indicated in chronic diseases, accompanied with debility, and unattended with feverish symptoms. Two species, which are, at first partial ones, require them more than all others.

IN DEBILITY OF THE DIGESTIVE ORGANS, attended with the usual symptoms of loss of appetite, flatulencies, distention of the bowels, acidity, and vomiting; or in dyspeptic symptoms, accompanied with diseased mind, called hypochondriasis; or in a debilitated state of the stomach and alimentary canal, from hard study, or debauch, the steel waters will prove decidedly useful; especially, if an aperient medicine, such as the waters of the saline well, or an aloetic pill, be interposed once or twice a week, to keep the body solutive during the time of drinking the chalybeate.

IN DEBILITY OF THE UTERINE VESSELS, producing obstructions, weaknesses, or sterility in females, the steel water proves extremely bene-

ficial. It is sometimes employed in preternatural evacuations of the uterus, to give strength to the extremities of the debilitated vessels. Steel waters are useful in cases of chlorosis, especially if they be accompanied with stimulating remedies, and horse exercise.

Cases of general debility are very numerous, but they require discrimination; for almost every disease either originates from, or is attended with, debility of the body.

In CONVALESCENT STATES of the body, where patients are recovering from fevers, bilious attacks, or other diseases, where no visceral obstructions remain, steel waters in youthful habits will restore the tone of the system, and prevent relapses. They are therefore used in cases of decayed constitution, from warm climate or free living. In habitual fluxes, brought from the Tropics, they will strengthen the intestinal fibres, and prove gently restringent.

In NERVOUS DISEASES, from relaxation or delicacy of habit, such as hysterical disorders, palpitations, terrors, imaginary sensations, irregularity and depression of spirits; or those of the paralytic kind, connected with the state of the brain, such as tremors and palsied limbs,

steel water will prove efficacious, in a great number of instances.

IN SPASMODIC DISEASES, from preternatural irritability of the nervous system, such as convulsions, St. Vitus's dance, and epilepsy, a course of chalybeate water will often prove beneficial.

IN CHRONIC INFLAMMATIONS of the EYES and EYELIDS, either scrophulous or otherwise, steel water will be useful, both as an internal tonic, and as a cooling restringent wash, externally applied.

This water may be drank, in most cases, on the intermediate days, or even on the same day that the saline waters of the other wells are used, provided the disease requires a bracing remedy.

Steel water is CONTRA-INDICATED in a great number of diseases, particularly in some of those which receive most benefit from the purging waters of the other wells.

IN INFLAMMATORY DISEASES, where the action of the sanguiferous system is increased, as in fevers, hectic states of the body, paroxysms of acute rheumatism, and gout, this water is not a safe remedy.

IN VISCERAL OBSTRUCTIONS, especially of

the liver and spleen, it is a hazardous remedy. It might restore the tone of the stomach, but it would increase the organic obstruction, by its stimulus and astringency.

IN DETERMINATIONS OF BLOOD to the head or lungs, it should be prohibited; therefore, in vertigo, constitutional headaches, and tendency to apoplexy; or in inflammatory asthmas, coughs, and consumption, it would be dangerous to increase the circulation, or to generate blood by steel water.

IN DROPSIES, it might act as a tonic, and give vigour to the absorbents, but in many cases the quantity of astringent fluid, would promote accumulation of water in the cavities.

IN CALCULOUS diseases, such as gall concretions, gravel, and stone in the bladder, the waters do not contain sufficient carbonic acid and saline matter to counteract their astringent property.

## CHAP. VII.

### AN ARRANGEMENT AND BRIEF HISTORY OF BILIOUS DISEASES IN BRITAIN, TO DISTINGUISH THOSE WHICH REQUIRE PURGING WATERS.

AS half the invalids who visit Cheltenham, are afflicted with bilious disorders, contracted either by long residence in warm climates, or by injurious treatment of their digestive organs, they require particular consideration in this treatise; but its circumscribed limits, will only admit of a cursory view of their history, for the purpose of discriminating the species which require purging saline waters, in greatest abundance.

Biliary diseases spontaneously divide themselves into two principal classes. Those which depend upon an altered structure in the liver or its appendages, and those which arise from a particular state of the secretion; independent of the secondary affections of the organs, from



pressure of contiguous parts, and the communication of their diseases, occurring nearly as often as the primary ones.

Most bilious diseases proceed from colonial heat, and when generated in cold climates, they arise from a peculiar temperament of body, from getting cold, from intemperance in eating and drinking, and from irregular modes of life. But they are most generally derived from the burning heat of the solar rays, or the liquid fire of the still, which is the reason that men are more frequently affected with these complaints than women\*.

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## SECT. I.

### DISEASES OF THE LIVER.

The immense size of the human liver, in proportion to the bulk of the body, manifests its great importance in the economy of life, and the peculiarity of its structure, explains the character of its diseases. No organs are so frequently affected as those of the hepatic system, for not

\* The only exceptions to this proposition are, jaundice and gall stones, to which women are most liable, from their sedentary habits.

only the large proportion of debilitated blood, received from all the abdominal viscera, but the tardiness of its circulation, render the liver extremely liable to different inflammations, torpor, and congestions.

Its uncommon vascularity, and softness of texture, subject it to frequent injuries from external causes. Its size, situation, and contiguity to other vascular organs, occasion frequent adhesions, and inflammations; and render it extremely difficult to distinguish, at all times, between the diseases of the abdominal and thoracic cavities.

So great is the influence of the liver over the whole system, that there is scarcely a part which does not sympathize with its affections, and many complaints referred to other organs, take origin in this gland. Gout,\* apoplexy, hypochondria, and piles, are frequently associated with diseased liver; and from the necessity of the biliary secretion for the healthy actions of the intestines and stomach, the hepatic and alimentary organs reciprocally partake of each others diseases. There is also a connection of blood vessels, by the three great branches of the celiac artery dis-

\* Darwin observes, in the first vol. of *Zoonomia*, that the effects of inebriation upon the liver is, to produce gout in the feet.

tributed to the liver, spleen, and stomach. But the connection is more immediate between the liver and spleen, than with the liver and any other organ of the system. The blood obstructed in either of these viscera, renders the other tumid, and their diseases, which are very similar, are communicated from one to the other. This connection is remarkably conspicuous, in lingering intermittents, where they frequently become tumid together, called *ague cake*.\* But the spleen, not being an organ so essential to life as the liver, can be increased to twice its natural size, without greatly disturbing the process of digestion, and its diseases are less fatal than those of other internal organs.

These observations favour the opinion of Boerhaave, who considered the liver as the origin of most of the chronic diseases which afflict the human species.† And it may be further sub-

\* Instit. med. p. 350.

† The immortal Lord Nelson was under the author's care, when he arrived at Jamaica, after taking Fort Omoah on the Spanish main. A severe intermittent fever produced tumefaction of the liver and spleen, which rendered his body as prominent as that of a person in the last stage of dropsy ; and he did not recover until he was sent to England, soon after which the ague and tumefaction of the whole belly gradually disappeared.

joined, that the deficiency of muscular fibres, and diminutive proportion of nerves, in its substance, stamp it with a character of great insensibility, which renders its diseases more latent and insidious, than any others that invade the human frame.

INFLAMMATIONS of the liver are of the acute and chronic kinds, known in this country by the systematic name, hepatitis, and in the East Indies where they are endemial, by the common denomination of liver complaint. This disease, although not altogether unknown in the West Indies, is by no means so prevalent as in the East, on account of the regular sea and land breezes, which cool the atmosphere of islands. And, in all probability, hepatitis would be equally universal in Guinea, which is hotter in most places than the East Indies, if it was inhabited by Europeans.\*

\* The diseases of Europeans in tropical countries are few and uniform. The yellow fever prevails in the West Indies, especially among strangers, on the sea coast, at all times of the year. In the East Indies, hepatitis, and cholera morbus prevail in the dry season, and the remittent fever and flux in the rainy one. The two former occur ofttest among persons

ACUTE, OR ACTIVE INFLAMMATION of the liver resembles pleurisy in the intensity of fever, and pain of the side, and in severe colds bringing it on, in the predisposed state of the organ. The pain most commonly extends from the right region of the liver, by the intervention of the phrenic nerve in the diaphragm, to the shoulder of the same side, and is accompanied with quick pulse—heat---thirst---difficult respiration---dry cough---and vomitings. The right hypochondrium is sometimes swelled, and painful to the touch, and the patient lies with greatest ease on the diseased side. Suffusion of bile is observed in the eyes---and the urine is high coloured---although real jaundice seldom attends the acute state of the disease. Hæmorrhagy frequently occurs from the nose, especially when the patient has not been freely blooded.

As the tumefaction of the liver arises from increased action and dilation of its vessels, it is most frequently carried off by the secretions, or artificial evacuations, and the gland returns to its natural state, but the disease has greater ten-

who undergo fatigue and exposure to the sun, but the latter are by much the most fatal. The remains of these diseases, fill Cheltenham with bilious patients.

dency to suppuration, than to any other kind of termination, and is less disposed to gangrene than other phlegmonous inflammations. The liver is found most frequently mortified in the plague, and putrid diseases, where inflammatory symptoms seldom arise to great height.

**CHRONIC, or OBSCURE INFLAMMATION,** the general concomitant of indurated and obstructed states of the liver, is often induced without active inflammation, and is therefore attended with little or no fever in the early stages; although much depends on the intensity and extent of the disease. Whether the liver be totally or partially affected, and whether the disease be in the circumference, or interior of the organ. The liver, a net-work of blood and lymphatic vessels, favours the deposition of various kinds of diseased matters into its substance, according to the specific action of the depositing vessels, and the general disposition of the gland at the time. This is most commonly a lymphatic déposite, which is at first local, while the rest of the gland continues in its natural state, but induces a degree of irritation or chronic inflammation, which extends the disease, and occasions its induration by increas-

ed absorption; but it advances slowly to sup-  
puration, from the natural insensibility of the  
organ. When a great portion of the liver is  
schirrous, a slight degree of fever with a  
fulness and obtuse pain of the side, takes place,  
often described by patients, as a numbness or  
weight of the part, but in a few instances, the  
pain is felt on the left side of the body. If the  
concave part of the liver contiguous to the  
stomach be diseased, vomitings and disturbed  
digestion are liable to occur. In the course  
of the disease, especially when the right lobe  
is the seat, the liver may be felt hard and  
ponderous, externally; but if the left lobe,  
which is equally liable to disease, be only ef-  
fected, the margin of the liver cannot be felt.  
In the beginning of the disorder the liver is  
generally situated high in the thorax, but in  
the progress of the disease it contracts by ab-  
sorption, and descends so low, that the great  
margin can be felt by the fingers, below the  
false ribs, in a callous state. And it may be  
made to descend two or three fingers breadth  
lower, by placing the patient in a sedentary po-  
sure, with the body a little bent forward, and  
making him fetch a deep inspiration, especially  
in the empty state of the stomach, than when

he is placed in the horizontal position, or with his stomach distended, which are less favourable to the discovery of diseases in the liver, by external examination.

An indurated state of the liver is perhaps one of the most common diseases of the East Indies, and often of such an indolent nature, that persons are afflicted with it for many years together, without knowing what their disorder is. They complain at first of diminished appetite—nausea—bitter taste of the mouth—low spirits—accompanied with foul tongue—sallow complexion—yellow eyes—and frequently with uneasiness of the right side; which symptoms they are apt to impute only to a bilious habit, but by continuing in warm climates, the disease proceeds to a fatal termination; whereas in Europe, by careful living, and the occasional use of evacuating remedies, those invalids may live as long as if they had no such disease. In the progress of the disorder, suppuration takes place, and brings on hectic fever; or the enlarged liver presses upon the bile ducts, and occasions jaundice. Sometimes, pressure on the thoracic viscera injures the vital functions; at other times it compresses the thoracic duct and large blood vessels, so as to induce swelling of the lower



limbs, and a train of dangerous hydropic symptoms, which make their appearance in different cavities. This schirrous state, which usually proceeds to suppuration, has been known in a few instances, to terminate in ulceration and cancers.

**THE SUPPURATIVE STATE OF THE LIVER** is a frequent consequence of the former diseases, but it is likewise common for abscesses to be found in the interior substance of the liver, after death, where patients never complained of pain of the part, during life, nor were suspected to have inflamed livers.

Two cases, communicated by the author's brother to the medical society of London, were published in the third volume of their memoirs. A patient in Jamaica died of consumption of the lungs, where the liver was found completely suppurated; and a woman died suddenly in labour, from the bursting of an abscess in the liver: neither of which diseases were known to have existed in that organ before death.

The mildest state of suppuration, where vomica, or small portions of matter forming cysts round themselves by pressure, continues for the most part, for years, without molesting the ge-

neral system. But when they become large abscesses, they are apt to discharge themselves into the nearest cavity, or bring on hectic fever and jaundice, which rapidly destroy the patient. But many of them are saved, by hepatic flux supervening, and by the bursting of the abscess into the gall ducts, or colon, or discharging itself externally, by an opening in the parietes of the abdomen.

Although the different chronic inflammations of the liver do not prove immediately fatal, yet they for the most part injure the health, and oblige invalids to have recourse to frequent means of depletion. Cheltenham water operating as a diluent, will facilitate the passage of the bile from the ducts, and lessen the fibrile action of the system. The waters of Bath, which are also used as diluents, cannot be employed with the same freedom, in cases of great irritation or hectic fever, like the neutral salts dissolved in a large portion of cold water, from the wells of Cheltenham. The Saline waters will also act by their purgative properties, in promoting absorption of diseased matter, and can be made either to co-operate with, or to succeed, the use of mercury, in chronic inflamma-

tions of the liver, where patients cannot always continue in the use of that powerful remedy.

**TORPOR** or **PARALYSIS** of the liver, is one of the most frequent bilious diseases met with in this country, and is seldom attended with much inflammation or pain. Habits of spiritous potation, or the constant ingurgitation of any other powerful stimulus, destroys the stomach, and changes the structure of the liver in a slow and gradual manner.

Dram drinking injures the liver more than it does the stomach, from the latter possessing greater powers of sensibility and muscularity, to recover its lost tone.\* The author was lately called to two farmers, who died of the consequences of hepatitis, from drinking largely of nothing but home-brewed ale, which was little stronger than good table beer. One of them drank ten or eleven quarts daily, producing continued slight inebriation for several years together, but had scarcely ever tasted spiritous liquors.

\* The ancients enlarged the livers of geese, by mixing spirits with their food, and it is said that hogs acquire swelled livers, by feeding on bréwer's grains.

In all these cases of the continued use of unnatural stimulants, although the liver may frequently escape from schirrus, yet it becomes debilitated, and secretes less bile, the ducts get thick and contracted; the bile is transmitted in diminished quantity, or in a viscid state, to the alimentary canal. Languor—nausea—diminished appetite—indigestion—fulness of the region of the liver—sallow complexion—heavy eyes—and constipated bowels succeed, and are too often followed by marasmus, schirrus, and dropsy.

In like manner, long residence in tropical climates, occasions the paralysis of the branches of the portæ, so often found among the visitors at Cheltenham. It is evident, that a rapid secretion of bile long continued, like other profuse evacuations, must weaken the vessels of the liver by repeated action, as well as by excess of the discharge, and produce a permanent predisposition to derangement of alimentary functions. Hence, it is not uncommon for invalids, after they arrive from the tropics, to be troubled with bilious symptoms, from the want of their accustomed stimulants, heat, and high seasoned dishes, without our being able to discover any organic diseases, except a paralytic state of the liver, manifested by bodily and

mental languor,) and by a train of dyspeptic symptoms.

In the same way continued anxiety, grief, or other depressing passions, which diminish the velocity of circulation, debilitate the hepatic system, and produce a similar train of torpid actions.

CONGESTIONS OF FLUIDS are common occurrences in the liver, although they do not always disturb the functions of the organ. Sudden derivations of blood to the liver---torpor in the branches of the portæ--diminished proportion of its secretion---or a viscid state of the bile, are liable to produce accumulations of fluids within the vessels of the liver, or depositions into its parenchymatous substance; and that such states frequently exist, independent of inflammation, comes within general experience, and is amply confirmed by dissections.

Sanguineous congestions are most common. No organ receives such different proportions of blood, and has a structure so much adapted to these congestions, as the liver. The area of the hepatic veins which carry away the blood, being so much smaller than that of the vessels which supply it, that we often find free living—lingering

intermittents—transferred gout—suppressed evacuations—and repelled eruptions—producing fulness, and uneasiness of the epigastric, and hypochondriac regions, and at times, rendering them tumid externally\* ; and this is the reason that discharges of blood by the hæmorrhoidal vessels, which are distant branches of the vena portæ and diarrhœas, are so frequently critical in diseases of the organ.

Serous congestions are not uncommon. The substance of the liver is often found in a soft, and œdematous state, which sometimes terminates in ascites. A case lately occurred to the author, of a female attacked with fever, and pain of the right side, who passed several whole hydatids by stool, which recovered her entirely from the disease.

Lymphatic congestions are found in the liver, of different kinds. The organ abundantly supplied with lymphatic vessels, the lymph is often deposited, and concreted—hence the many instances of hard tumours, and of tubercles,

\* The liver is often found on dissection, tumid, soft, and dark coloured, in scorbutic patients, putrid fevers, and in those who have died with dilatations in the right auricle of the heart.

found in the liver upon dissection, particularly of scrofulous patients.

Bilious congestions are often found diffused in the substance of the liver, or the *pori biliarii*, and the roots of the hepatic duct gorged with bile; hence the numerous cases of small gall-tones found in the substance of the liver, and impacted in the duct near its origin.

The constitutions of patients with torpor, or congestion of the liver, not being able to bear the lancet, nor violent evacuations, and the sensation of fulness in the hepatic system, suggesting the necessity of a purging plan; they generally find their way to Cheltenham, for the benefit of the waters and climate. The saline waters drank daily, or three or four times a week, will remove plethora and fulness, from the hepatic organs, and at the same time, free the stomach from states of distension, which must aggravate the complaint, and press the liver upwards, to the detriment of the vital organs in the thorax.

But in all these diseases, as well as in chronic inflammations of the liver, exercise in the air should be joined to a course of the waters,

to invigorate the habit, which will promote the absorption of fluid, or indurated matter in the substance of the organ, and expel the stagnant fluids that obstruct the biliary passages. The hepatic vessels in their soundest state, are of so torpid a nature, that respiration and the action of the abdominal muscles, are essential to the circulation of the blood through them, as well as for the passage of bile through the inert and passive gall ducts; how much greater then, is the necessity of muscular movements, when the torpor is increased by diseases? The author considers exercise on horseback, which agitates both the muscles, and internal viscera of the trunk of the body, to be the most effectual of all remedies, that can be conjoined with Cheltenham water, for paralysis and states of congestion in the vessels of the liver.

Numerous other affections of an organic nature, besides these enumerated, have been found by dissection in the liver, and receptacles of gall; such as alterations of colour and texture---displacements---concretions---extraneous bodies---and malformations---which must have affected the living functions more or less, although unattended with symptoms sufficiently marked, to distinguish the species with accuracy; but they



cannot be objects of separate consideration in a treatise of this kind. We can, however, recommend Cheltenham water, as more likely to prevent their generation, and aftergrowth, than any other remedy.\*

Besides the diseases arising from a morbid change of structure in the liver—numerous others depend upon the derangement of its secretions.

\* The following principal ones, have been found by dissection: Stones—and cancers in the substance of the liver. *Boneti sepulchretum*, an. 1700, tom. 2. sec. 17. Frequently a flaccid—and œdematous, structure of the liver—dropsical hydatids—worms—and polypi in it. *Bianchi Historia Hepatica*, 1725, tom. 1. part 2. c. xi. The liver swelled—greatly contracted—covered with white scabs—*Lieutaud Historia Medica*, 1767, tom. 1. sect. vi. The liver as if boiled—extending to the left side—frequently displaced—adhering to neighbouring organs—deeply subdivided—double—gorged with steatomatous matters—and containing white schirri. The gall bladder wanting—its coats thickened—remarkably thin—contracted—dilated—distended with bile—and often containing calculi. *Morgagni*, 1769, *Epist.* 3, 7, 22, 24, 29, 30, 39, 47, 48, 57. The coats of the liver cartilaginous—its substance soft—hard—ruptured—ulcerated—containing cysts of earth—tubercles of the common—large white—soft brown—and scrofulous kinds. The gall bladder wanting—containing hydatids—its coats adhering to other organs—bony—schirrous—the coats obliterated—dilated—and ulcerated internally, *Ballie's Morbid Anatomy*, 1809.

## BILIOUS DISEASES IN BRITAIN.

### SECT. II.

#### DISEASES WITH A DERANGED STATE OF THE BILE.

Bile is a fluid so readily soluble in water, and so easily coagulated by acids or alcohol, that physiologists have been able to ascertain its nature by chemical analysis: in its usual state, passing into the intestinal canal, it is a viscid green fluid, which consists of water, soda, albuminous, and resinous matters. The water and albumen give the bile its proper consistence. The alkali saturates the acid of the stomach, formed by digestion. And the resinous matter imparts a bitter, antiseptic, and soapy property, to the alimentary mass. Some authors have likewise consigned it a share in the nutritious process, by separating the chylous from the fæculent matters of the alimentary canal, for without doubt, the colouring matter of the resin imparts the chief darkness to the contents of the lower part of the tube. But the most important use of the bile, is, to stimulate the bowels to perform their peristaltic motion; absolutely neces-

sary for digestion, and for carrying the food regularly through the body. It is not however a strong stimulant to the alimentary organs in their sound state. The author administered in several cases, from 25 to 35 grains of bile, (taken from the human subject and oxen) made into pills. This never produced more than one laxative evacuation, except in one patient, who, during the hot season being in a feverish habit of body, was considerably purged by a dose of that strength. Neither does bile stimulate the vital organs, or other parts of the animal body, than the alimentary canal. On the contrary, when the blood is saturated with bile, in cases of jaundice, the pulse becomes slow, and the moving powers torpid. In like manner, when a patient lives long enough to be completely jaundiced, he generally recovers from the yellow fever in the West Indies.

Symptoms indicating derangement of the biliary secretion, attend almost all diseases of the alimentary organs, either from the superabundance, deficiency, obstruction, or vitiation of the fluid.

## DISEASES WITH INCREASED FLOW OF BILE.

This is the consequence of continued atmospheric heat, or of vascular irritation in the liver; Bile is naturally secreted in greater abundance than any other fluid of the human body, except the urine and perspiration. But in cases where the circulation of blood is greatly hurried, especially through the liver, the bile will at times pass from the ducts in a full stream, and in a thin crude state. The author has seen more than a quarter of a pint of bile, vomited every half hour for days together, in fever, at the time the patient could retain no drink upon his stomach five minutes. In most cases of increased secretion, and without fever, the alimentary organs becoming surcharged with bile, have their functions greatly disturbed. The body is sometimes constipated, but for the most part, the alvine discharges are increased, and of a dark colour. The blood in these cases is liable to be saturated with bile. The numerous absorbent vessels in the liver and gall bladder, furnish the serum of the blood with bile, which tinges the eyes, skin, and secretions more or less yellow.

A **BILIOUS STATE OF THE STOMACH** is one of the most common effects of superabundant bile. On passing rapidly into the duodenum, great part must be regurgitated into the stomach, since the opening of the common duct is within a few inches of the lower orifice of that organ; and we have likewise reason to believe, that copious discharges of thin bile, stimulate the duodenum to contract, which must force bile into the stomach, particularly in the morning, when the stomach is empty, and the gall-bladder surcharged with the secretion.

Bile collected in unusual quantity in the stomach, induces the following dyspeptic symptoms: Loss of appetite---nausea---foul tongue---bitter taste of the mouth---thirst---tendency to vomit---fullness of the epigastric region---low spirits---frequently heaviness and bilious turgescence of the eyes---and scanty high-coloured urine. Bile is so abundant in hot climates, as to be ejected both upwards and downwards, without any existing disease. The author has known numerous instances of people in Jamaica, who were obliged to take the juice of one or two large oranges every morning on first waking, to neutralize and carry off the bile. It also forms a neutral salt with the acid of the stomach, when

superabundant, and occasions frequent green stools, particularly observable in children during the lactescent period. Its resinous part not entering the circulation, the contents of the alimentary canal become dark, in proportion to the abundance of bile and acid in them, so that we possess the means of ascertaining both the state of the biliary secretion, and of the stomach at the same time, by attending to the appearances of the alvine discharge.

Cheltenham waters are more serviceable in removing the excess of bile from the stomach than most other remedies, but they ought to be drunk in small doses, that it may be able to retain them. There will be frequent occasion to take the water warm in this state of the stomach, which may be rejected, but much vomiting should never be encouraged, as in all cases of redundant bile, the proper exit is downwards.

SICK HEAD-ACH, accompanied with bilious vomitings is a disease often met with in medical practice, but has only been lately noticed as idiopathic by Dr. Fothergill.\* It appears to

\* The posthumous works of Dr. Fothergill, published by Dr. Letsome in 1803, page 212, vol. III.

arise from a periodical accumulation of bile, and the author has had several patients of bilious habits labouring under the disease, after long residence in the West Indies. Violent headaches return every three or four weeks, affecting the eyes almost to blindness, accompanied with sickness of the stomach and generally with vomitings of bile, which continue from one to three days. Females, who are the principal sufferers bring it on, or render the paroxysms more severe, by fatigue, costive bowels, and irregular modes of life, particularly on the approach of the monthly periods.

This habitual disease is difficult to cure, but receives benefit from emetics, and laxative medicines, administered before, or in the beginning of the paroxysm. One patient of the author's recovered so much from a course of Cheltenham waters seven years ago, that she had no returns for a year afterwards, which was the last time he saw her. He has lately seen several others derive advantage from the use of the waters in this disease.

**CHOLERA MOREUS**, the autumnal epidemic of Europe, is a notorious instance of redundant bile, and often of a diseased nature. It attacks

the constitution excited by summer heat, with sudden loss of strength, fever, and bilious vomiting. The peristaltic motion of the intestines, which naturally proceeds from the stomach downwards, is at times inverted through the whole canal, so that its contents are returned upwards; but at other times it is attended with purgings. Although in Britain this is commonly a mild disease, yet it sometimes is extremely violent, attended with spasms in the calves of the legs, and a feeble contracted pulse, which has been known to terminate in dysentery or jaundice, and even to kill the patient in two or three days.

Cheltenham water cannot be used in this acute disease, indeed, in every case of inverted intestinal motion bulky nauseating remedies, which increase the exertions of the stomach, should be avoided.

**BILIOUS DIARRHEA**, is another instance of redundant bile. Nausea---foul tongue---bitter taste of the mouth---and frequent alvine dejections take place, without gripes or fever. Spontaneous diarrhea is most commonly an effort of nature to carry off superabundant bile, or to effect the crisis of other diseases.



Small portions of Cheltenham water may be useful in many cases of diarrhea to expedite the removal of bile from the system, but it will be more so when employed as a previous step to checking the disease by opium or astringent medicines. Bilious patients can seldom bear violent purging, and the author has known a single copious evacuation of bile, produce a great degree of languor, in the advanced period of life.

**DYSENTERY.** Sanguineous flux is so greatly connected with excess of bile, that it commonly occurs in climates which produce violent bilious diseases, and in Europe only in camps and fleets, in the autumn of the year. It is often attended with a morbid condition of the liver, but we cannot consider the state of the biliary system as the cause of a disease propagated by contagion, although it undoubtedly disposes to its attack.

The chronic state of the disease is frequently brought from abroad. The acute symptoms of fever---gripes---tenesmus---and sanguineous dejections having subsided, irritability, or ulceration of the large intestines with frequent mucous evacuations, continue for months, or even years, until patients resemble walking skeletons.

The intestines not being able to clear themselves, tenesmus, a principal symptom of this disease, takes place, which renders the occasional use of laxatives, particularly of neutral salts, necessary to clear the upper part of the intestinal canal, and increase the secretion from the glands, without gripes; but the steel waters will be more likely to remove the morbid irritability of intestines, in habitual fluxes.

**BILIOUS FEVERS**, the scourge of tropical countries, are attended with vomitings, and jaundice, from excess of bile, and they now and then occur in Britain in the autumn of the year, after a sultry season. But it does not appear to the author, that they arise from an acrid state of the bile, so much as from a morbid irritability of the alimentary organs, which had taken place in them, previous to the vomiting. The appearances usually ascribed to acrid and putrid bile, in these diseases, must therefore be imputed to the state of the alimentary tube and liver; and at the same time to the febrile condition of the body, increasing the flow of bile, which becomes putrid by increased heat, like any other fluid detained in an inflamed part.

Medical practice in tropical countries, where

fevers are always attended with excess of bile, consists almost entirely in the free use of bitter laxative drinks, to remove bile, and allay the febrile action of the system. The author had seventy patients every day under his care, in Antigua Hospital in the West Indies, who were either afflicted with yellow fever, or dysentery; and as their stomachs could retain nothing solid for a minute, he followed the practice of that hospital, which was to give them, indiscriminately, as much cold water, wherein a log of quassia wood had been steeped, as they could use. The effects of that portion of the bitter laxative, which remained upon their stomach, were to wash away the bile, and to invigorate the habit, sinking under the fatigue of perpetual vomiting.

In like manner the practice of the ancients in Europe, was, to give large draughts of cold water, to check the vomitings of intermittent fevers. The author has always found cold water, corrected by a bit of toasted bread, to be one of the most useful drinks in bilious vomitings of every kind. Although Cheltenham waters cannot be administered in acute fevers, these facts sufficiently prove its utility in feverish states of the body, accompanied with excess of

bile, in this climate ; but it must always be kept in mind, that smaller portions of purgatives, will operate upon bowels which are irritable, and where bile is redundant, than in most other cases.

#### DISEASES WITH DIMINISHED FLOW OF BILE.

Diminished secretion of bile is as much the consequence of coldness of climates, as its increased flow is of their heat, and its deficiency is not a less frequent concomitant of diseases.

The secretion may be lessened by diseases occupying the place of the secreting vessels in the liver, as happens in its schirrous and suppurative states. By debility and torpor of the hepatic vessels, occasioned by the habitual use of internal stimulants, or long residence under a vertical sun ; which states of the body have already been considered.

It may likewise be lessened by a sympathetic action between the gastric and hepatic systems, from their mutual subserviency to the nutritive process. And also by general torpor, diminishing the circulation of the blood, in the melancholic, and chlorotic temperaments.

Any of these causes may diminish the secre-

tion of bile or render it viscid, which will deprive the alimentary organs of their due proportion of natural stimulus, and occasion diseased action of the system.

**DYSPEPSIA.** Indigestion is at different times combined both with a redundant, and a deficient flow of bile. But the dyspepsia of this country is most frequently attended with the latter state, since costiveness, from diminished peristaltic motion, is the most usual symptom accompanying it.

The stomach in its weakened states, does not digest the food properly, and communicates only a feeble action to the intestinal canal. The aliment thereby remaining in them, longer than the natural period of twenty-four hours, its thinner parts are absorbed in an acrid state, and the accumulation of the indurated parts, distends the large intestines—induces uneasiness, and a feverish habit—furred tongue—emaciated body—sallow countenance—and high coloured urine.

Dyspepsia is never long confined to the digestive organs; the liver and its secretions are brought into consent. The bile becomes deficient, or flows irregularly. The relative situ-

ation of the organs subservient to nutrition, is admirably contrived by nature. The bile, collected in the gall-bladder during the empty state of the stomach and duodenum, is forced from it when it is distended, at the precise time it is wanted for digestion of a full meal. In like manner different states of distension constantly occurring in the stomach, and transverse arch of the colon, from disengagement of flatus in dyspepsia, produces such different degrees of pressure on the liver, and its excretory channels, that the body is sometimes purged, although for the most part costive, and the evacuations artificially procured, are frequently frothy, greasy, and of a grey appearance.

Cheltenham waters are more used for states of indigestion than for any other diseases, and generally with the happiest effects. They increase the peristaltic motion, and solicit a flow of bile, while at the same time they strengthen the stomach, and remove the fœculent part of the food; the consequences are, that invalids seldom drink them ten days together, without experiencing some improvement of appetite. Nausea and vomiting are also powerful stimulants of the liver and ducts, hence the improvement of the appetite and healthy action of the

biliary system, which take place from sea sickness.

**HYPOCHONDRIA.** The hypochondriac disease is another state of dyspepsia, accompanied with dejection of mind, and diminished flow of bile. It occurs most frequently in the melancholic temperament, which is characterized by general torpor, sluggish secretions, and costive bowels.

But stomach complaints scarcely ever arrive at great height, in any state of the constitution, without affecting the mind. Hence flatulency—distension—acidity—costiveness—and erratic pains about the ribs, are usually accompanied by languor and a melancholic state of mind, turned inwards upon the bodily sensations. The immense volume of air extricated from a small portion of food in dyspeptic diseases, by distending the great arch of the colon, produces so much uneasiness, that it often encreases the alarms of the patient about the nature of his disease. No doubt a lax and flaccid belly, and a clean tongue, are always the best presages, in diseases of the trunk of the body.

The intimate connection subsisting between body and mind, is in nothing more remarkable

than in the effects of the depressing passions upon the stomach and liver. Bad news will instantly remove the keenest appetite, and produce a pain of the stomach; while grief diminishes the flow of bile as suddenly as a paroxysm of anger increases it.

As hypochondria is generally attended with fulness of habit, and with viscid or deficient bile, gentle evacuating remedies, become as necessary for the cure, as tonic ones. Hence the astonishing number of patients who receive relief in this disease, from Cheltenham water conjoined with exercise on horseback, and with variety of amusement.

MANIA occurs most frequently in the melancholic temperament. A dark complexion, with dark or black hair, and a costive state of the bowels, characterize the constitutions of two-thirds of insane persons.

The connection of this disease with a peculiar state of the liver, which constitutes part of the hereditary disposition to it, is confirmed by the great number of diarrheas and dysenteries supervening to madness; by hæmorrhoidal discharges often preceding convalescence; and by the general utility of drastic purges and emetics.



in curing the disease\*. But we cannot consider Cheltenham water as at all applicable to any state of mania.

**CHLOROSIS**, a morbid irritability, which disturbs the healthy actions of every part of the female constitution, between the ages of 17 and 25, is accompanied with deficiency of bile, from languid circulation in the liver†. To avoid the mischief that might arise from mistaking the disease for a jaundiced state of the body, it must be observed, that there are no appearances of absorbed bile in the eyes or urine. The green hue and paleness of the skin, depend upon a paucity of red globules in the blood; which imperfect state of sanguification is greatly increased by defect of bile in the intestinal canal.

The general weakness and inactivity of the system, together with the dyspeptic and œdematous symptoms which attend the disease, indicate the employment of the most powerful tonics, in

\* Vide Haslam's Valuable Observations on Madness, 2d Edition, 1809.

† "Those persons who secrete least bile, have a sanguineous complexion, soft hair, and lax fibre, in whom the sanguific powers are weak, as in chlorotic females."—Dr. Saunders on the Liver, p. 161.

preference to purging waters ; but there are not wanting instances of chlorotic patients deriving benefit from the salubrity of the climate, and the occasional use of the waters of Cheltenham.

#### DISEASES WITH OBSTRUCTED BILE.

Interruption of the bile in its passage from the liver to the intestines, occur more frequently in this, than in tropical climates, most probably from greater viscosity of bile. Besides the train of dyspeptic symptoms, which depend upon deficiency of bile in the alimentary canal, another set takes place from its absorption into the blood.

We judge of the presence of bile in the circulation, by the yellow colour of the skin. But this is not at all times, and in every part of the body the same. In jaundice it is discovered chiefly in the eyes and face. In febrile diseases it is more in the skin of the body ; and in some diseases it appears in irregular tints, interspersed over different parts of the surface. But in general it is first discovered tinging the serum of the blood in the white tunics of the eyes, and passing from the system in the transparent urine.

The following diseases are the most notorious

instances of obstructed bile; and it is remarkable, that the same cause should produce such different sets of symptoms, at different times.

**JAUNDICE** is not a disease of the bile, and seldom of the liver. Its occasional occurrence from paroxisms of passion or hysteria, has been explained by spasmodic contraction of the common duct; from dram drinking by thickening of its coats; and in early infancy from mucous fluids choaking the mouth of the duct.\* But four times out of six its occurrence in the progress of life, arises from concretions obstructing the gall ducts. It is therefore seldom fatal, when the glandular viscera are sound; but when schirrosities of the pancreas or liver produce jaundice, dropsy is liable to supervene. There are some instances of jaundice, happening with a pervious state of the ducts, and the patient not at all costive. In the bilious and yellow fe-

\* The jaundice so frequently occurring immediately after birth, is so little of a disease, that it disappears spontaneously, or by the administration of purgatives, in a few days. And the author considers it as arising from the sudden change in the distribution of blood, by the division of the umbilical chord. The excess of bile and copious green stools, natural to the early part of the infant period, is owing to the over-proportioned liver, and velocity of the circulation.

ver, the bile is secreted so profusely, that the area of the excretory channels seem hardly sufficient to permit its free passage to the intestines.

Some variety of character may arise from these different causes, but the symptoms in the alimentary organs are usually a deep seated pain in the epigastric region, which patients at times describe as a faintishness, and sinking at their stomach; and at other times, as an excruciating pain extending to the back bone, and down the abdomen, without much alteration of the pulse from its natural state. Since neither the liver, gall-bladder, nor ducts, are irritable organs, the cause of the pain has been explained by the calculus distending the common duct at its oblique entrance, between the irritable coats of the duodenum; but it is a remarkable fact, that the pain is generally felt at the pit of the stomach, although the opening of the common duct into the duodenum is considerably to the right side of it. The deficiency of bile in the intestines occasions a great variety of dyspeptic symptoms, and when the obstruction of the duct is complete, an obstinate costiveness, with white or clay-coloured evacuations, take place. The symptoms from the absorption of bile, are, general torpor--loss of strength--low spirits--slow

pulse--yellow eyes and skin--red coloured urine--cuticular eruptions and itchings of the skin--and the appearance of bile in all the secretions except the milk.

The best remedies are emetics, to accelerate the circulation in the liver, and force the biliary passages by compression and percussion; but purgatives are also necessary, to stimulate the intestines to discharge their fluids. Cheltenham water will answer this indication, and by its attenuating properties, help to dissolve the obstructing cause; but it will more effectually relax the ducts when taken warm, than in its cold state.

BILIARY CONCRETIONS passing the ducts, occasion more violent symptoms than those of jaundice, and are generally attended with a feverish habit of body, but with no great yellowness of the skin.

The author has twice seen a chronic state of this disease, where the concretions remained quiescent for several years. The patient was troubled with dyspepsia--fulness at the region of the stomach--uneasiness when it was empty--irregular bowels--dark sediment in the urine--and sallow complexion, which were ascribed to a bilious constitution, but terminated suddenly

by passing gall stones, with paroxisms of pain and spasm.

When the concretions are entering the intestines, there generally occurs a deep seated pain, darting from the pit of the stomach to the back bone, and sometimes extending to the right shoulder and arm. The insensible ducts admit of so much dilatation, as now and then to permit a stone to pass, as large as a pigeons egg, the pain must therefore be seated at the narrow and less dilatable opening of the common duct, between the irritable coats of the duodenum. It is often so intense as to bring the whole system into sympathy, which endeavours, by repeated paroxisms like those of parturition, forcibly to expel the foreign body, so that vomitings---hiccup---chilly fits---contracted pulse---and convulsions sometimes succeed.

In a few days, when those symptoms suddenly disappear, a small soft concretion, perhaps no bigger than a pea, and often of a white colour, or with a bilious tinge, may be found in the alvine evacuations, by passing them with water through a sieve. But as the gall bladder, in these cases, generally contains others, the disease is very apt to return after a time.

Gall-stones have lately been discovered by dissections, to be as common in this climate as

urinary calculi. They are seldom found in the hepatic ducts, where the bile is thin, but mostly in the common duct, where it is viscid, and the gall bladder is often completely filled with these calculi, which were not known to have existed till after death. However much biliary calculi differ in hardness, shape, colour, and size, there is no essential difference in their nature. They are all bitter, and consist of crystalline layers formed on a nucleus of bile; they dissolve in the same fluids, most of them inflame, and a great number swim in water. A viscid state of the bile from cold or inactivity, favours their production. Hence they are extremely abundant in the gall bladders of horned cattle, between the months of November and March, when the season is cold, and the cattle confined to the stall.

Cheltenham water can be of little service in the painful paroxism of passing gall-stones. Relaxants of the most powerful nature are generally resorted to. But in chronic cases, they may be drank with as much success, as any remedy whatever, with a view to promote their dissolution, but more especially to facilitate their passage from the biliary channels, and to obviate distention of the abdomen, with other dyspeptic symptoms, which always attend obstructed bile.

## DISEASES WITH VITIATED BILE.

The enthusiasm of ancient physicians, in ascribing malignant fevers, vomitings, colics, and fluxes, to acrid and black bile, was very general. But most modern ones, consider these diseases to arise from a morbid condition of the solids, and ascribe the vitiated appearance of the bile, to the escape of blood from debilitated vessels, in putrid states of the body, or to the union of carbonaceous matters with the bile, in the alimentary canal.

The bile in its natural state is an antiseptic, which obviates the tendency of the aliment to run into the putrefactive fermentation; and the blood saturated with bile, for years together, in cases of jaundice, does not turn putrid. The black colour it acquires in diseases, commonly arises from its union with blood, or from the heat of fever. At the same time, bile naturally of a dark green colour, when superabundant, like the red particles of blood, gives a deep tinge to a great quantity of other matter. But in temperatures above a hundred degrees of Fahrenheit's scale, bile turns putrid in a short time, and becomes black, and offensive to the smell; this degree of heat however, is greater



than the standard heat of the healthy body in any climate.

Bile in its healthiest state, varies considerably in consistence and bitterness. These are less, when the liver is strongly excited to action, than when it is in a torpid state: when it flows in the hepatic duct, than when it has suffered remora in the gall bladder; and when it is diluted in the duodenum, with the salivary fluid of the pancreas, than when it passes the common duct. These facts enable us to explain the different predispositions of the body to specific diseases, in tropical and cold countries.

A gradual and constant application of intense heat to the human body, imperceptibly changes the state of its stamina, by inducing relaxation and debility, which predispose the habit to putrid, and bilious diseases. Thus, a greater external circulation of blood, and increased discharge from the cuticular pores, are general conditions of the system in hot climates; observable by an increased sensibility of the skin to external cold, and by a constant moist state of the surface, requiring change of linen once or twice a day.\* This exterior circulation

\* Heat suddenly applied to the body, produces more dangerous effects. The constitution not having time to accommo-

exhausts and weakens the inferior vessels of the body, from which vital energy and strength are chiefly derived. While at the same time, the increased circulation of blood in the liver, from heat, augments the secretion of bile, by which means it is transmitted more copiously to the alimentary organs in a thin and crude state, so as to irritate them, particularly in their excited state. But tropical diseases seldom occur, even in the predisposed state of the body until a morbid irritability, or an erisipelatous inflammation has taken place in the internal membranes of the chylopoetic viscera, which subjects them to receive supernatural stimulus from their own fluid, in a manner similar to what happens in catarrh, with the mucous membrane of the throat, when inflamed, the disease is increased and propagated by the irritation it receives from its own secretion, which differs only from its natural state in quantity and increased tenuity.

date itself to the climate, the quick transition from Europe to the West Indies, in a few weeks, induces the yellow fever, so fatal to Europeans on their first arrival. Whereas, those persons who perform a voyage of five or six months to the East Indies, are not liable to that disease.

Without entering into the controversy, concerning bile as a cause or symptom of diseases, we can freely state our complete evidence of its existence in a vitiated state, in a great number of instances. In dyspepsia bile is often thrown up with the contents of the stomach in a highly acrid, and corrosive state. Bile is vomited in cholera morbus evidently diseased, and sometimes with as great rapidity as if a patient had swallowed poison. Copious discharges of fœtid and putrid bile, are not uncommon occurrences in fevers of the putrid, bilious, and remittent kinds, as well as in the plague, colics, diarrhea, and dysentery. In some diseases, the bilious evacuations resemble the washings of flesh, and in others they excoriate the anus. Cuticular eruptions, and itchings of the skin, often take place from absorption of bile in jaundice, to such a degree as sometimes to have puzzled the author to distinguish them from the real contagious itch. Biliary calculi are generated from viscid bile, and from a peculiar disposition of its elements to crystallize, in cold countries. Numerous other instances might be adduced if it was necessary, to prove the degeneracy of bile.

The different appearances of the bile itself in colour, taste, smell, and consistence, indicate

#### BILIOUS DISEASES IN BRITAIN.

a difference in its properties. Morgagni relates the case of a painter, who died of convulsions, after a tertian fever, where the intestines and stomach were found on dissection loaded with eruginous bile, of such an acrid nature, as to corrode the scalpel, and poison animals.\*

The opinion of the ancients concerning the destructive properties of black bile, was greatly confirmed by the utility of purgative medicines in the cure of malignant diseases; and there is no doubt, but the saline waters of Cheltenham are of great service, in removing acrid and vitiated bile from the alimentary canal, while at the same time they encrease the demand of the system for new matter, to secrete healthier fluids. Upon these principles, we explain many of their excellent effects in most bilious diseases of a chronic nature.

\* Morgagni relates different dissections where the bile was white, saffron-coloured, brown, red, green, black, fæculent, viscid, sandy; and where the gall-bladder, ducts, stomach, and intestines were loaded with acrid bile, like ink. *Tom III, Epist. 59. Art. 18. Tom. II. Epist. 30. Art. 16.*

## CHAP. VIII.

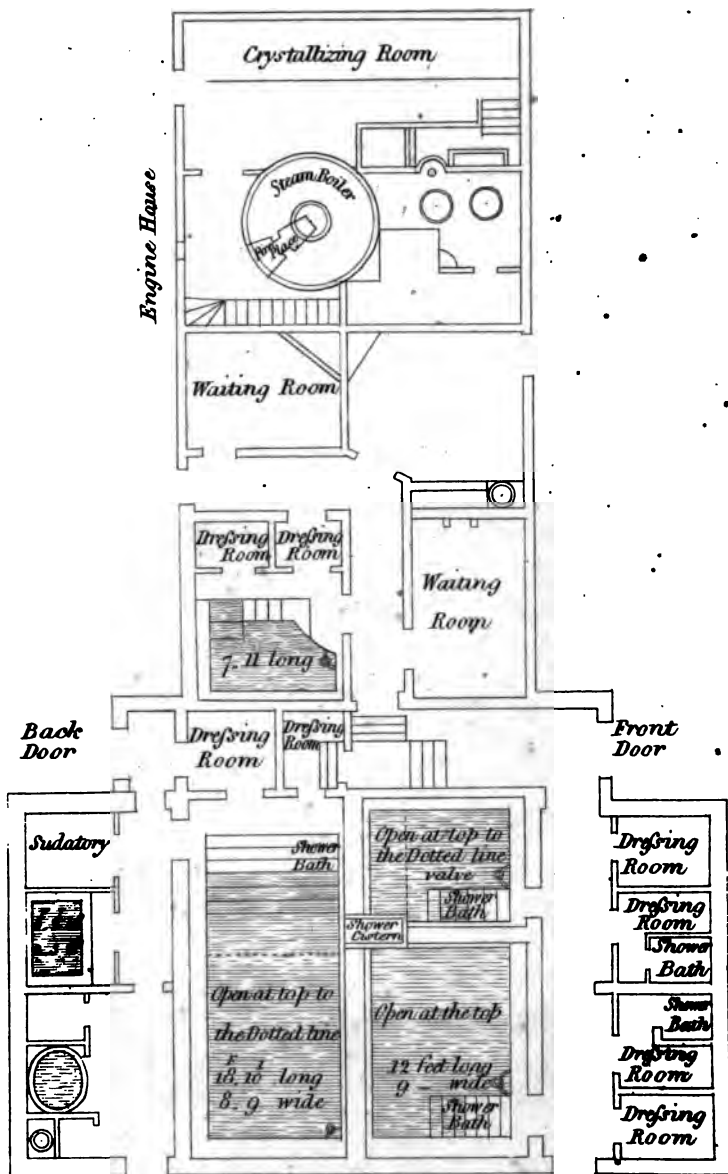
### ON THE BATHS, AND DIFFERENT KINDS OF BATHING, AT CHELTENHAM.

HOT and Cold Baths have been in use at the top of the town of Cheltenham, since the year 1787; and are well known to have been conducted with skill and attention, by Mr. Freeman; who still continues the business in that situation, and likewise performs the operation of cupping with uncommon dexterity.

But as new baths are completed upon a larger scale, by Henry Thompson, Esq. on the south side of the river Chelt, opposite to Cambray, a short description will explain their utility and conveniences, and render the nature of their complicated machinery, intelligible to the bathers.



# PLAN of the New Baths at CHELTENHAM.



## SECT. I.

## DESCRIPTION OF THE NEW BATHS.

There are six baths, two of them cold, and the others tepid or hot, with a cold shower-bath attached to each. They are plentifully supplied with common spring-water, and at the same time are fitted with pipes, which communicate with the mineral wells in the fields above, for the purpose of making saline baths, when water can be spared from drinking. These baths are ready for use at all times of the day, from seven in the morning till seven at night, and in every season of the year. Four of them are built of stone, with smooth stone bottoms, and are large enough to swim in, which will prevent the confinement of the body, particularly detrimental to it when immersed in a cold fluid.

Three of the baths are without windows, as they are lighted and ventilated by an opening in the top of the building; one is entirely open, another about a third part, and the largest has half of the roof uncovered. Hence, the bathers cannot be overlooked; and the internal atmosphere



is preserved in so pure a state, that steam never appears, even on the surface of the hot-baths, until the temperature of the water exceeds 96 degrees of Fahrenheit's scale. Although the openings at the top of the baths appear to the author to be of great utility, yet as some persons object to warm bathing, where the external atmosphere is admitted, there are three smaller baths, which are covered over, and have windows at considerable height in the building.

The water is preserved in the baths at the uniform height of four feet and a half, and continually flows into them by pipes of cold water and steam; and out of them by a waste pipe of an inch and a half diameter. They are besides completely emptied every two or three days, and filled again in the space of an hour; by which means the water is always fresh and pure in the baths. They are heated early every morning, and one of them kept all day about 70° a little warmer than Matlock water, and another between 94° and 96°, or the lowest degree of hot bath. But they receive additional heat after six o'clock, so as to constitute baths of the highest temperatures, for the rest of the evening. There are smaller baths for those who wish to regulate the heat to any

particular degree, or to increase it during the time of bathing.

The dressing-room, which adjoins each bath, has its atmosphere warmed by horizontal cylinders of sheet copper containing steam, 6 inches in diameter and 7 feet long; and the passage at the entrance of the baths, is warmed in the same way by large copper globes, which enables the bathers to dress and undress, without the risk of getting cold. Separate sitting rooms are provided for the use of ladies and gentlemen waiting for baths.

An apartment is fitted as a sudatory, lined with sheet tin and boards, which can be filled with *dry air*, equally heated, or with *vapour*, for the same purpose of sweating, in obstinate chronic diseases. There are also conveniences for *dry pumping*, or the fall of water from a height, which differs from the shower bath, by being forcibly directed to particular parts of the body.

An ingenious apparatus is likewise attached to the closet, with an elastic tube and pipe, to enable patients to administer to themselves enemas of warm saline water, merely by turning a stop cock in a descending pipe. The degree of heat, as well as the quantity, and force of the fluid, can be regulated with precision. A practice

which must prove extremely useful in obstinate bowel cases, sent to Cheltenham from all parts of the kingdom.

HEATING the baths, is performed in a rapid and uniform manner by means of steam. But this mode is by no means a new one, since a steam boiler has been in use for many years past, to heat a number of coppers in the dying house of Mess. Gott and Co. at Leeds. And it was suggested more than 8 years ago by the celebrated Count Rumford, that it would be an excellent plan to heat baths in the same way;\* accordingly, private baths belonging to the Prince of Wales, and Colonel Johnston, in London, have been heated for some time past by the astonishing powers of steam†. But as no baths have been heated by steam in any part of the kingdom upon so large a scale as those at Cheltenham, and the invaluable improvement of transmitting heat to considerable distance by vapor, cannot be too generally known, it may not be improper to notice the saving of time, labour, and fuel

\* Count Rumford's Essays 1802, vol. III. Ess. xv.

† Steam has lately been employed at the king's mills, as a safe and effectual mode of drying gun-powder.

accomplished by the following machinery, which heats the rooms, passages, and baths, while at the same time it evaporates water for making salts\*.

In the engine-house adjoining the baths, there is a *cast iron boiler*, which works with two hundred and eighty-seven gallons of water. It is similar to that in general use for steam engines, with the addition of an apparatus for the manufacture of salts, viz. a float and gauge plate, to ascertain the strength of brine; a mercurial thermometer, to regulate the degrees of heat; and two adjoining coppers to evaporate salts, by the fire that heats the boiler.

From this boiler ascends a vertical steam tube, to the top of the building, to prevent the fluid syphoning from the boiler, and then branches off into a number of horizontal *steam conductors*, constructed of sheet copper, of four inches diameter, which convey steam to the baths, distant about 6 or 8 yards from the boiler. They are suspended a few inches from the ceiling and walls of the passages leading to the baths, and are

\* The operative engineer, Mr. Rawlinson, has exhibited great skill in constructing the machinery to answer every intention, in the most complete manner.

covered with cloth listing, to prevent the too great escape of heat, and consequent condensation of the contained steam, by the colder atmosphere.

At their termination in the bathing places, there is a *valve*, which can be opened more or less, by a brass apparatus, to regulate the quantity of vapour to be admitted into the smaller *steam-pipes*, as occasion requires.

These steam-pipes are likewise constructed of sheet copper, two inches diameter, and descend in the baths perpendicularly, to become continuous with a *cast iron pipe* of the same bore, which passes round the bottom of each bath. The cast iron pipes being stronger than the copper ones, cannot receive injury, from the violent ebullition, which ensues when steam enters a bath filled with cold water ; whereas copper ones would burst, by the resistance the cold water makes to the steam. These pipes open at the bottom of the bath, as heat only ascends in fluids, but there can be no danger from treading upon them with the naked feet, as the water always keep them at its own temperature. A jerking noise is generally heard, as if a pump was working in an adjoining room, by the conflict of steam and air meeting the cold water in

the iron pipes, and therefore subsides in proportion as the baths become warm.

At the end of each steam conductor, where the valve shuts off the vapour from the baths, there is an inch pipe of copper, to convey away the condensed water and air, which would injure the soldered joints, and occasion a strong resistance to the passage of the steam. All these become united in one pipe, which terminates in a cistern, that supplies water for the hot-shower bath, and dry pumping, in the room for invalids.

By these various contrivances, four thousand five hundred gallons of water, in one bath, were heated to near a hundred degrees in half an hour, with less than two thirds of the coal that would have been consumed by the fire applied in any other way. The heat is also regulated in the nicest manner possible, and to any degree wanted; for the steam, which proceeds from the boiler only three or four degrees above the boiling point, heated one of the stone-baths to 170° in less than two hours, and would soon have made the water boil in the bath, which could not have been accomplished in twice the time, with the same proportion of fire, directly applied to the water of the bath.

## SECT. II.

## ON BATHING IN GENERAL.

The benefits to be derived, from the different kinds of baths, are very various ; but the following appear to be the most general ones.

ABLUTION of the skin is not the least essential object of bathing in all its forms, especially to persons in the habit of wearing flannel next their skin ; and as writers have laid so little stress upon this part of the subject, the author has been induced to offer the following observations.

The practice of lavation, to cool and keep the surface of the body clean, is a fundamental law of animated nature, for the preservation of health.

The human skin is continually emitting vapour from the extremities of its exhalent vessels, consisting of the superfluous and noxious particles of the blood, combined with an oily matter, particularly observable when condensed upon the surface of the body in the fluid form, called sweat. The cuticle covering the true skin, an inorganic scaly membrane, bedewed with this oily

mixture, preserves the surface in a soft and sensible state, but from its extreme porosity, favors the production of different kinds of foulness. Therefore, in civil society, washing with soap is daily practised, as the skin is too greazy for common water ; and in countries where habiliments are not worn, the dust penetrates so readily through the cuticle, that bathing, and anointing the body, are in constant use, to preserve the surface clean, supple, and perspirable.

Although the accumulation of healthy perspiration does not immediately produce diseases, since married people do not usually contaminate each other, yet when it is long retained on the hot surface of the body, it becomes a source of irritation to the persons themselves, as well as to others. The accumulation sometimes occasions a sour smell from the elements of sebacic and phosphoric acids, separated from the body with it, which renders the frequent changes of apparel, absolutely necessary. Clean linen promotes the exhalation of the skin, and like capillary tubes, drinks it up by thousands of mouths. But when it is not continually renewed, the pores of the skin become obstructed by accumulation of perspirable matter, and the linen gets rot-



ten, or requires much friction and soap, to remove the stains which it had acquired by keeping.

That the retention of this secretion upon the surface of the skin, irritates it, appears plainly from strengthening plasters, which confine the perspirable matter, producing in five or six days, pimples, and troublesome itching of the parts beneath ; and from the poorer classes of people, being liable to a great number of cutaneous diseases, through defect of cleanliness.

Putrefaction, which is always going on in living bodies, is corrected by food supplying new matter to their systems, and by the exhalation of noxious particles from their surface : hence both animals and plants are rendered healthy by frequent washing. But as man devours more animal food than other creatures, his perspiration is more acrid, and he has a more copious exhalation from the surface of his body, than any other species of the same kingdom. The human body loses by its surface above fifty ounces in 24 hours, near a third of which is exhaled from the lungs, of so poisonous a nature as to destroy animals who breathe it, in a short space of time ; and the alternation of the cuticu-

lar and pulmonary secretions with each other, is a fact supported by every phenomenon of perfect animals.

If then the retention of the secretion of the skin, from accumulated matter obstructing its pores, prove detrimental to the healthy state of the body, how much greater must the injury be, when it is in a state of disease? The retention of perspiration in persons labouring under febrile disorders, has often generated the most deleterious contagion, where the atmosphere has been impure or confined. And the importance of all kinds of bathing, which removes acrid particles from the cutaneous pores, in every part of the body, and gives the entire vessels of the skin activity to increase the proportion of their exhalation, may be perfectly understood from the refreshing effects of the partial washings in daily use among all civilized nations.

Bathing is practised by many people as a LUXURY, not merely from its agreeable operation on the sentient surface, but also from its salutary effects on the general system. The cold bath exhilarates the spirits, and gives the sensation of a vigorous well being, which words cannot express. In like manner hot and tepid baths, produce tran-

quility of mind, and bodily repose. The warmth affords a pleasing sensation to the nerves of the skin, and acts on the muscular fibres in removing fatigue, like a charm; and baths of every kind, when they agree with the constitution, have a tendency to improve the appetite, by increasing the activity of the cutaneous arteries.

Never was a luxury so general in any country as bathing in all its forms, among the Greeks and Romans. There were eight hundred and fifty-six public baths, besides numerous private ones, in the ancient city of Rome; and the Romans spent so much time in going through the different processes at the baths, that they had hardly leisure to eat one meal a day.\*

Another salutary purport of bathing, more particularly of the cold bath, is, to LESSEN the IRRITABILITY of the skin, and to destroy its susceptibility to slight impressions, which renders it a powerful preventive of diseases. That the degree of sensibility of the skin, depends upon the stimulus it is in the habit of receiving, may be illustrated by many familiar instances, of

\* H. Mercurial de art Gymn. lib. i. cap 11.

people rendered irritable by warm cloathing, and living in heated rooms, or by long residence under the influence of a vertical sun, which keeps the surface in a perpetual state of heat and moisture. The greater tenderness of the feet, than of the hands and face, which are more vascular and nervous, arises from the heat they are always kept in, and their total exclusion from the tonic powers of a cold atmosphere. Hence the lower classes of people in the highlands of Scotland, and north of Ireland, endure the continued application of water and frost to their naked feet, with impunity ; while their southern neighbours get cattarrhs, and bowel complaints, from the slightest humidity communicated to their feet, through a thin pair of shoes. In like manner, people from tropical countries, are little able to bear even the coldness of the summers of Britain, for some years after their arrival ; and several East India gentlemen have told the author, that the Buxton water, which was recommended to them as a tepid bath, proved an intollerable cold one.

But heated chambers are the most general of all causes, of the diseases of this country. Men acquire thereby a degree of tenderness, which

exposes them to perpetual cattarrhs, from the natural state of the atmosphere. The variations in the climate of Britain, often exceed 25 degrees in 24 hours, from the cold north-easterly winds, which blows from the Continent in the spring and autumn of the year, alternating with the south-westerly winds, from the Atlantic Ocean; and nothing but early habits of hardiness, can fortify the constitution against the mischievous effects of these sudden transitions. Mankind enjoy the best health, who are constantly exposed to the weather in infancy, and are subject to the greatest number of diseases, when the seasons confine them to the house; by reason of the circulation of cold air, improving the state of the digestive powers, and destroying the irritability of the skin.

In like manner, cold bathing blunts cuticular sensation, and fortifies the body against the sudden variations of an uncertain climate. This is remarkable in guides at watering places, spending the greatest part of the day in cold water, without experiencing any disagreeable effects from it; and in the natives of Russia, who destroy the susceptibility of the skin, to the stimulus of an unfriendly climate, by accustoming it

to the greatest extremes of cold and hot bathing.\*

Bathing is more employed by adults in this country, for the CURE OF DISEASES, than for any other purpose; but as baths of different kinds and temperatures are required for their application to disorders, they must be considered separately. It cannot, however, form a part of the author's plan, to specify the different morbid states of the body, and the various diseases, to which bathing may be rendered subservient. The statement of a few leading circumstances, of the difference of baths, and their most general employment in diseases, are all that come within the limits of this treatise: at the same time it must be premised, that patients should trust to nothing less than a minute consideration of their

\* All ranks of people in Russia, are in the habits of inducing a burning heat, or copious perspiration of the skin, by the vapor bath and friction, and immediately afterwards plunging into cold water or snow, which in time becomes a great luxury to them. Vide an account of the Russian baths, in the 2d Edition of Dr. Saunders's *Treatise on Mineral Waters*, accompanied with many judicious observations on bathing, and a description of those in Finland, in a valuable *treatise on sea-bathing*, by Dr. A. P. Buchan.

particular case, before they enter upon bathing. Cold and hot baths, may be generally safe to the healthy, but to the invalid, they are remedies of too powerful a nature, to be a matter of indifference in any case. Consumptions, fevers, and rheumatisms, are not uncommon consequences of autumnal visits to the sea; and the physician always finds it necessary, to be extremely cautious in giving his opinion respecting bathing, in cases of obstructed viscera, and local plethora.

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### SECT III.

#### ON THE DIFFERENT KINDS OF BATHING.

The COLD BATH may be considered as including every degree of heat between  $32^{\circ}$ , the freezing point, of Farenheit's scale, and  $66^{\circ}$ , the temperature of Matlock water, but the one most commonly selected for use, is about  $60^{\circ}$ ; which is the heat of the sea near the shores, in the autumnal months, and the mean temperature of covered springs during the year, in the island of Britain.

This temperature suddenly applied to the extended surface of the naked skin, at its common heat of 96°, proves a powerful stimulant to the whole body, but more particularly to its cutaneous surface. The severe shock to the nerves of the skin, and the contraction of the external vessels, soon bring on a central re-action of the heart and arteries, which determines the blood to the surface of the body, with greater force than before the shock. Hence the first symptoms of pale skin, shrivelled surface, oppressed breathing, and the occasional occurrence of cramps, in the lower extremities, are succeeded by a glow of heat, which removes the constriction from the external parts, and has always been considered as the criterion of the salutary operation of cold immersion.

Hence the cold bath by rousing the general system to action, and encreasing the activity of the cutaneous vessels, cures morbid states of the body, where the circulation is languid, and the powers of life inactive. In the ricketty and scrophulous habits of young people, in the melancholic and nervous temperaments of middle age, and in most cases of debility unattended with visceral obstruction, it proves a valuable tonic.



The cold bath has likewise been employed with various degrees of success, in convulsive diseases, such as tetanus, epilepsy, St. Vitus's dance, hydrophobia, and the hysteric disease. But without doubt it is too dangerous a stimulant for cases of local plethora, hectic fevers, bowel disorders, organic obstructions, internal pains, and the rigidity of old age.

The following will be found the most useful method of conducting the bathing. The autumnal season has always been preferred for sea-bathing, as the temperature of the atmosphere, and of the sea at the shores, approach nearest each other in that season; but in situations where patients can be accommodated with water at any temperature, bathing will not be improper at any time of the year. In this latter case, the temperature may be gradually lowered, at different times of bathing, from that of Buxton water at 82°, to the cold bath at 60°, which will diminish the hazard, in cases where the propriety of cold bathing may at first be doubtful, and will render the shock less alarming to nervous and timid persons. The author has frequently seen children lost, by the inability of

mothers to enforce dipping them in cold water, which would have been obviated, by previously accustoming their skin to water in a warmer state.

It is equally improper to plunge into a cold bath, when the body has been overheated by exercise, as it is to bathe, when the body is chilled or fatigued; but it is in general better for the animal heat to be rather above, than below, the natural standard; and highly injurious for persons to continue long naked to cool themselves, before going into the bath; since the augmentation of a few degrees of the natural heat of the body can only increase the degree of stimulus, and consequent re-action of the system.\*

But the practice of the hardy Russian of plunging into the bath in a state of profuse perspiration, which he has performed daily, the greater part of his life, would be a hazardous one to the constitution of a Briton, who only bathes occasionally.

\* Dr. Currie often experienced the refreshing effects of plunging into cold water, after the heat of the body had been increased two or three degrees in the hot bath: vide *Medical Reports on the Effects of water*, by Dr. Currie, M. D. 2d Edition, vol. 1. p. 129.

States of repletion and inanition are equally unfit for the cold bath. It cannot therefore be recommended in the same day, with a purgative medicine, although drinking Cheltenham water as a laxative, by no means interdicts the use of cold bathing. Nor can the morning, when the system is empty, be chosen as the best time of the day for bathing; nor immediately after dinner, when the vital energies are exerted upon a full stomach. The evening is also an unfit time, on account of the increased velocity of pulse, and sensibility to cold, which usually accompany the digestive process, unless it be intended to produce perspiration in the night. We therefore prefer the forenoon, about two or three hours before dinner, when the system is vigorous and active, as the time for cold bathing least liable to objection.

On first going into the bath, every part of the body should be cooled alike, for the neglect of wetting the head, is a frequent cause of severe headach; but it is not necessary to plunge in head-foremost. The superior parts of the body may be wetted with the shower bath, or the patient may walk briskly into the bath, wet the face, and suddenly draw the head under water.

It is nearly a general rule, that the colder the bath is, the less time the patient should continue in it, and the greater his action ought to be in the bath. A few dips, or immersion for a few minutes, to allow time to rub the body, will, in general be sufficient to excite re-action, when the bath is very cold, and then there will be no danger of robbing the machine of its animal heat, by long-continuance in the water.\* Shivering, chattering of the teeth, and slight headach, are common symptoms of beginning re-action, and do not counterindicate cold bathing; but when the constriction of the skin continues permanent, without the circulation returning to the surface, the bath will be attended with debilitating effects, similar to those which arise from fatigue, want of food, and exhausting evacuations. When therefore the symptoms of cold-

\* The abstraction of heat from living bodies by a cold medium, has been employed, in a gradual manner, as a successful remedy in particular fevers; but it cannot, in any case, be drawn off from the body, to a great amount in a sudden manner; since life depends, upon the capacity of animal bodies to preserve equality of heat, under the different circumstances of external media, and when drawn off so suddenly, that the body has not time to generate-it fast enough for the consumption, inordinate action, and various diseases, generally succeed this direct attack upon the vital principle.

ness, shivering, headach, languor, want of appetite, and low spirits, continue after bathing, a warm fluid, or some kind of cordial should be taken, and the use of the bath remitted for a time, or a warmer one substituted in its stead.

On coming out of the bath, covering with a flannel gown, drying, and rubbing the skin, together with gentle exercise on leaving the bathing-place, will be the most effectual means of rendering the re-action as complete as possible.

The COLD SHOWER BATH differs little from cold immersion, in its effects upon the body. It cannot be considered as producing so effectual a re-action, by the sensation being more lenient. But it has the advantage of being less terrific, and frequently more easily obtained, especially in cold weather. Many people prefer it to cold immersion in the winter season; and persons subject to cramps in the cold bath, find it an excellent substitute, unattended with the risk of producing so painful a symptom. It may also be employed as a preparation, to wet the superior parts of the body on going into a cold bath; or to enable persons to bring them-

selves in a gradual manner to cold bathing. The different new baths now at Cheltenham, having shower-baths attached to them, affords persons an opportunity to follow the Russian practice, of showering themselves with cold water after coming out of a hot bath.

The **TEPID BATH** includes an extensive range of temperature, from Matlock water at 66°, to the hot bath, at 93°. The practice of tepid bathing obtains more and more every day in this country, both as a medium of health and pleasure. Its soothing, refreshing, and invigorating effects are easily acquired luxuries; and in diseased states of the body where the pores of the skin require to be opened without producing profuse perspiration, it proves an invaluable remedy.

The sensation of warmth, and not of heat, cannot be considered as much of a stimulant. It produces neither the re-action of a cold bath, nor the permanent stimulus of a hot one: the effects, however, are relative to the degree of the temperature of these baths.

The lowest heat of the natural tepid springs of this country, is that of Matlock at 66°, ge-

nerally considered as the limits of the cold bath. Then follow Bristol water at 74°, Buxton at 82°, and the Cross-bath, in the city of Bath, from 92° to 94°, at a distance from the spring. The lowest degrees of these heats, give a slight shock to the irritable and delicate habit, at the commencement of bathing, and are frequently employed as preparatives for the more stimulating and tonic powers of a cold bath. No remedy can be in more esteem than Buxton water for cases of diminished action and sensation, which follow inflammations of the extremities and joints. Numerous chronic rheumatisms are cured in debilitated habits, by beginning with high degrees of the tepid bath, descending to the temperature of Buxton water, and terminating with that of the sea.

As the superior temperatures of tepid baths give no shock, nor accelerate the pulse, they are sometimes employed for diseases of the lungs, and hectic states of the body, where neither the cold nor hot baths can be ventured on with safety. They may also be used in chronic diseases, which require the purging waters of Cheltenham, and in many dry, and scurfy states of the skin; for, like hot baths, they will wash off the

humour, and prevent its recurrence, by encouraging the exit of noxious particles through the pores of the skin.

The agreeable sensation, and lenient operation of tepid water, induce many people to remain in the bath above half an hour. The length of time, however, cannot be matter of indifference, where temperatures are various, and their effects depend on the state of the body; and for the same reasons, the duration of the immersion can only be determined, at the time the baths are to be used.

The HOT BATH may be considered as including all degrees of heat between  $93^{\circ}$  and  $120^{\circ}$ . The latter temperature being an extreme that the body can bear, when gradually applied to it;\* but perhaps the most useful one is about  $97^{\circ}$  or  $98^{\circ}$ , and water at this temperature being equal to the natural heat of the human body, and greatly superior to that of the atmosphere, when applied to the extended surface of the

\* The hottest of the natural Thermal waters in this kingdom, is that of the King's-bath, in the city of Bath, which has a temperature of  $116^{\circ}$  immediately from the spring, and is preserved by continually flowing in, at from  $100^{\circ}$  to  $110^{\circ}$ , in the bathing-places.



naked skin, stimulates the general system, without the severity of a shock, but more especially its cutaneous surface. Hence arise the redness of the skin, dilatation of its vessels, increased sensibility to cold, flushing of the face, and the occasional headaches, which so often succeed hot immersion at this temperature.

But the stimulus of external heat is not the only exciting power of the warm bath ; for the hot water, by impeding the escape of animal heat from the surface of the body, increases the quantity of secretion from the skin and lungs; and occasions moisture to break out on the forehead, by the accumulation of heat in the system ; agreeable to the usual course that nature pursues, in freeing herself from superabundant heat, by the process of evaporation.

The variation of a few degrees of heat is attended with different effects on the body. The inferior temperatures of hot baths, being considerably below the standard of animal heat, they neither increase the velocity of the pulse, nor stimulate the system to any great degree. On the contrary, they soothe the sensitive organs, and restore the lost powers of the machine. One of the most important uses is to alleviate the painful diseases of the urinary organs ; and

to promote the passage of concretions through the urinary and biliary channels.

Another most important purpose of baths moderately heated, is, to rouse the nervous energy and the languid powers of the general system, which render them useful in palsies, melancholic diseases, and in cold œdematous states of the extremities. Their mild and permanent stimulus, has occasioned them to be employed, in scrophulous swellings of the glands of the neck and belly, especially hot sea-bathing, aided by the salubrious breezes of the sea: for it hardly admits of a doubt, that saline impregnations increase the virtues of water in bathing. The pressure of a denser fluid upon the circulation of the surface, as well as the stimulus from the saline particles left on the skin, assist the temperature of water in curing diseases. Hence the cause of the saltiness and roughness, discovered on the skin immediately after sea-bathing, and the experience of mariners, that they do not get cold from the spray of the sea, as they do from rain water. They have also been used, time immemorial for softening the dry, and cleansing the diseased states of the skin, and for retarding the progress of rigidity, which destroys the functions of the body in old age.

But in proportion as the heat of the bath exceeds the natural heat of the skin  $96^{\circ}$ , the velocity of circulation increases, which renders it essentially necessary to regulate the degree of temperature by the thermometer, as it can never be duly ascertained by the sensations, which vary with the different states of the body, and afford no criterion of actual temperature.

Superior degrees of hot water are used after a course of mercury, in spasmodic diseases, in bowel complaints, and in almost all chronic cases, which require copious perspiration; but it is often necessary for this purpose, to raise the heat to a hundred degrees during immersion, before the sweat will break out on the forehead. Higher temperatures than that, however, should seldom be resorted to, as they may accelerate the pulse to a dangerous degree, and should always be avoided, where there are appearances of fulness in the vessels of the head or lungs, which is a principal reason why purgatives and bleeding are so often prescribed, as preparatory steps to the use of hot baths, in full habits.

As baths above  $98^{\circ}$  accelerate the pulse, they cannot be safe in full states of the stomach, nor immediately after violent exercise. The best time of the day for hot bathing, will be two or

three hours before dinner, without it be intended to bring on profuse perspiration, the evening will then be the most favourable time, to obtain the aids of a warm bed, and copious diluting fluids.

Persons seldom think of plunging into a hot bath as they do into the cold one, where the instantaneous shock is required ; and the author has lately met with several instances of disagreeable effects experienced, from plunging into baths which were unequally heated.

The grateful sensation of external heat to the skin, together with the tranquil state of the system, arising from the diminished exertion of the vital powers generating animal heat, when the temperature is moderate, induce many people to continue longer in the bath than necessary. The hotter the bath, the less time a patient should remain in it, but the precise time can only be determined by the nature of the disease, and constitution of the patient ; general practice admits of a latitude between ten minutes and half an hour.\* Care must be taken not to con-

\* The celebrated Count Rumford found no benefit from the common practice of remaining 15 minutes in Harrowgate water at 96° or 97°, three or four times a week ; but when he

tinue so long as to bring on faintness, or debility.

On coming out of the bath, covering the body as quick as possible with a flannel gown or warm sheet, and retiring to a warm dressing-room to be wiped dry with heated cloths, will prevent chilliness being produced by the atmosphere evaporating water from the naked skin, in its greatly excited state, immediately out of the bath.

THE VAPOUR BATH has nearly the same effects on the body, as hot fluid in the condensed state; but the temperature is higher, and it may be rendered so hot as to scald the skin. The intensity of stimulus from heat is therefore greater, and with the addition of rarified moisture, the vapour bath increases the velocity of the circulation, and induces perspiration more readily than common hot baths. It was in great esteem among the Romans, who diversified bathing in every way possible, and is at present much employed on the continent of Europe, but is still

used it every day two hours before dinner, and continued half an hour in the bath each time, his appetite, spirits, and general health, improved in an extraordinary manner. Vol III. Essay xiii.

little known in England, although it is a powerful remedy that deserves more attention. Chronic rheumatism, loss of appetite, cold paroxisms of fever, and diseases of the bowels and stomach, such as flatulency, vomiting, cholic, constipation, and indurated states of the belly, are the morbid conditions of the body, to which it has been most generally applied.

**DRY PUMPING** is an effectual mode of stimulating particular parts of the body, with either cold or hot water, which is in great reputation at Bath, and derives the name, from the body being kept dry, while water is pumped on its extremities. The partial application of the stimulus of heat or cold, excites warmth and sensibility in torpid organs, and is employed for strains of tendons or muscles, and for deep-seated, and obstinate diseases of the joints.

The water is generally used at a high temperature, and from fifty, to two or three hundred strokes, are given at a time; and the stimulus may be encreased to any degree, by increasing the temperature of the fluid, the number of strokes, and the height of the fall. As it does not usually affect the general system, it may be used daily, and at any hour most convenient.

The HOT AIR BATH is a mode of applying intense heat to the surface of the body and lungs. Dry air equally heated to as great a degree as the patient can endure, encreases its solvent power and solicits a more copious flow of perspiration, than heat applied by means of a denser medium. The Romans had buildings attached to their baths, which contained heated air, produced by various means, for sudatories; which they often employed for the purposes of creating artificial hunger and thirst.

When we consider that the human body, commences nearly in a fluid state, and grows gradually more and more dense, by the actions of life, until the organs are no longer able to perform their functions, from rigidity, we can account for the utility of different baths, and for their general operation upon the various states of the body, as they occur in the succeeding periods of life. During the first twenty years of human existence, the soft stamina in a state of preparation for more mature functions, become subject to diseases of laxity and debility, and they therefore derive greatest benefit from the stimulating and condensing powers of cold water. In the next twenty years, the solids of the ma-

chine, in their most perfect and vigorous state, render the body liable to fevers, and inflammatory diseases, and it receives greatest benefit from the mild operation of a tepid bath. And in the last twenty years of human duration, the rigid materials in a state of decay, subject the body to diseases of debility, and ill-performed actions, and it receives greatest benefit from the warming and softening powers of the hot bath.

THE END.



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